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BULLETIN OF THE TORREY BOTANICAL CLUB
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PROEMBRYO AND EARLY EMBRYOGENY IN TAXUS CUSPIDATA

CLARENCE STERLING

Until recently, the phylogenetic theories developed in conifer embryogeny by the investigations of Buchholz (1918, 1920, 1929, 1931, 1936, etc.) and his students have been unchallenged. In an extensive critique of the ideology of the Buchholz concepts, Thomson (1945) has also called attention to the criticisms of Goebel (1933) and Doyle and Looby (1939). Likewise, Allen (1946) has suggested a divergent view of the evolutionary status of "cleavage polyembryony."

In considering nutritional factors in embryogeny, Thomson (1945) has stressed the need for an experimental approach. In addition, in testing any phylogenetic theory, it is imperative to gather observational data from all forms. This necessitates a reinvestigation of older materials as well as comparative studies in unknown genera and species. Continuing the study begun by the author (Sterling 1948), the present paper considers the development of the proembryo and early stages in embryogeny in *Taxus cuspidata*. The terminology regarding stages in embryo development is essentially that employed by Allen (1946) while Buchholz' (1929) definitions were followed for specific structures in the young embryo.

Materials and Methods. The sectioned material used in this investigation was collected and prepared as described earlier (Sterling 1948). Embryos were dissected out in 1946 and 1947 according to the method outlined by Buchholz (1938) and were mounted in balsam after staining in acid fuchsin and fast green. Drawings were made by camera lucida and microprojection.

Fertilization. The process of fertilization in the conifers has been particularly studied in the Pinaceae, in which morphological sequences appear to occur more or less synchronously in individuals of a particular species at given sites. (In families in which chronological precision is less marked, detailed descriptions of fertilization are less frequent.) Most attention has been focused upon the behavior of the groups of male and female chromosomes during the process. Recently, Allen (1946) has contributed observations on fertilization in *Pseudotsuga* and analyzed some of the conflicting opinions on the program of events. In this paper, it is not intended to review the various studies on the act of fertilization. Owing to the lack of critical material showing stages between entry of the male gamete and the telophase of the first zygotic division, the present study cannot contribute to the question of chromosome behavior.

[THE BULLETIN for July–August (75: 335–468) was issued July 26, 1948.]

As described earlier (Sterling 1948), the functional sperm nucleus comes into contact with the egg nucleus and sinks into it. The fusing nuclei move to the base of the archegonium with the male nucleus still lying in an indentation of the female (fig. 7). These nuclei, as well as the early proembryonic nuclei, are embedded in a very grandular, deeply-staining mass of cytoplasm occupying the base of the egg. This dense cytoplasm differs from that about the unfertilized egg nucleus in structure and staining quality and may contain a portion of the cytoplasm of the sperm cell.

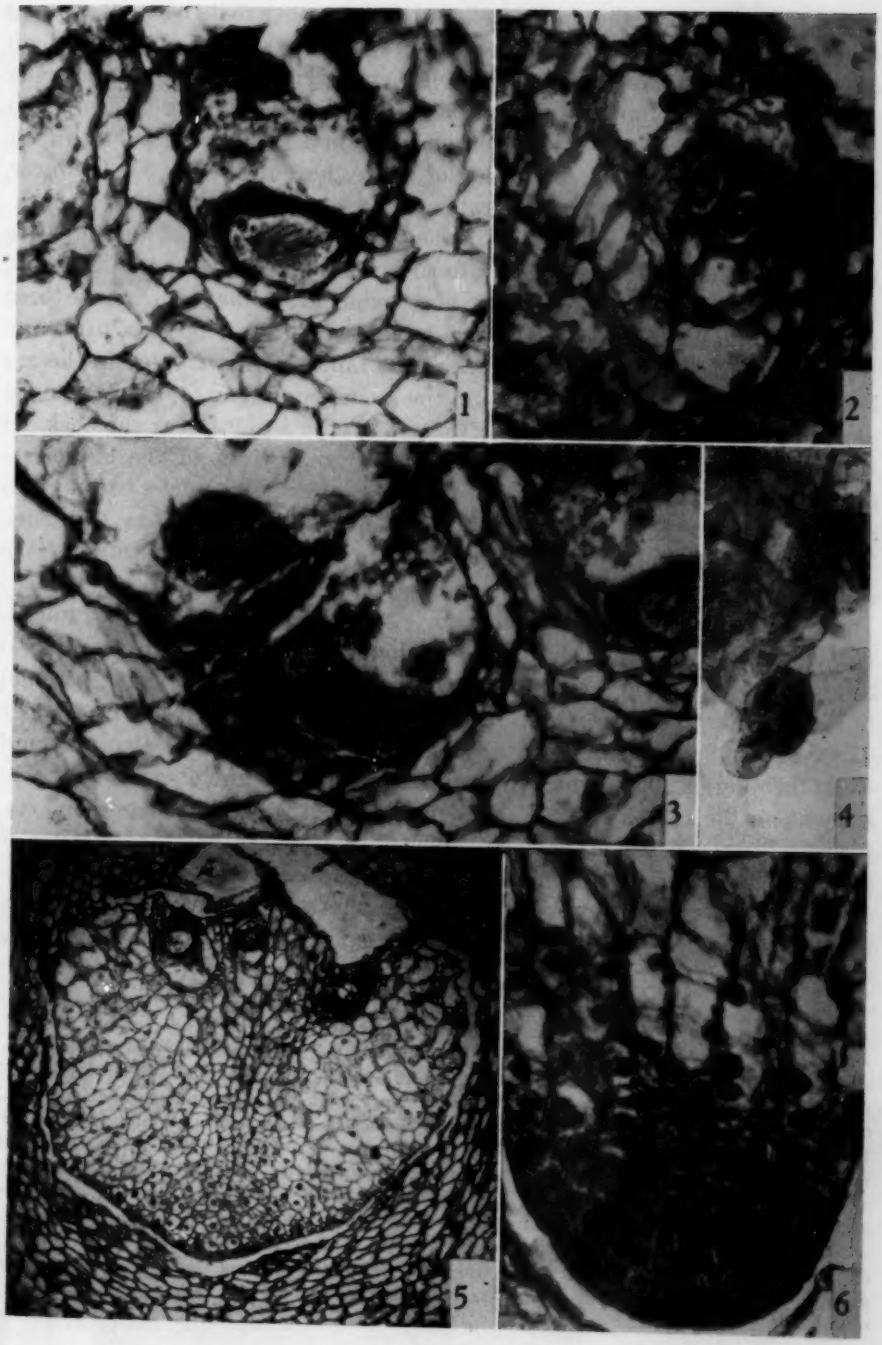
The question whether complete fusion of nuclear substance takes place must remain unanswered. Two preparations were found in which there appeared to be a single resting nucleus at the base of the egg. All other material at this stage showed either the two fusing nuclei or the telophase of the first division (fig. 1). With these as the only phases found in this critical period, it is not difficult to accept the resting fusion nucleus as a normal temporary condition of the zygote, as was found by Jäger (1899). A resting zygote is also described in *Juniperus* (Nichols 1910), *Tetraclinis* (Saxton 1913), *Sequoiadendron* (Looby & Doyle 1937), *Sequoia* (Lawson 1904a), *Cryptomeria* (Lawson 1904b), *Podocarpus* (Looby & Doyle 1944), and *Saxegothaea* (Looby & Doyle 1939). However, more closely spaced stages are needed to determine chromosome behavior at fertilization and the normality of a fusion nucleus in *Taxus*.

The fact that the number of pollen tubes is always equal to or greater than the number of zygotes constitutes indirect evidence that only one of the two sperm cells of a pollen tube is functional. In addition, it is often possible to recognize three supernumerary nuclei in the upper part of the fertilized egg, these nuclei being presumably the second sperm nucleus and the two vegetative nuclei from the pollen tube.

Free Nuclear Stages of the Proembryo. The first division of the zygote was found as early as May 12 in 1946. In this division, the spindle is transverse to the long axis of the archegonium (fig. 1). The two sporophytic nuclei are not separated by a cell wall, and they usually lie close together in the dense mass of zygotic cytoplasm in the base of the egg. On occasion, the first division may take place in the center of the archegonium, before the zygote has reached the base (also Sugihara 1945). Thus the first two nuclei may be

Explanation of figures 1–6

All figures are longisections, with micropyle toward top of page. FIG. 1. Archegonium showing spindle of first sporophytic division. Note density of zygotic cytoplasm. ×300. FIG. 2. Binucleate proembryo near center of egg cell. ×300. FIG. 3. Archegonium in center shows portion of 4-nucleate proembryo. At right is another section of the egg in figure 1. ×300. FIG. 4. Multicellular embryonic group at tip of an isolated suspensor cell in same embryo system with embryo of figure 35. ×150. FIG. 5. Megagametophyte with proembryo in archegonium at right. Note differentiation in central axis and at base of prothallus. ×75. FIG. 6. Median section of free embryo apex, showing multicellular massive apex prior to differentiation of stele promeristem. ×300.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found in the center of the egg (figs. 2, 8) but soon move to its base. The second division in the proembryo often occurs in the same transverse plane, at right angles to the first, producing four nuclei symmetrically disposed in one tier which is perpendicular to the long axis of the archegonium. Sometimes this arrangement may vary, so that the nuclei lie in a single row, partly in the base and partly along the lower side of the archegonium (fig. 3). However, these other instances of the 4-nucleate stage occur less frequently.

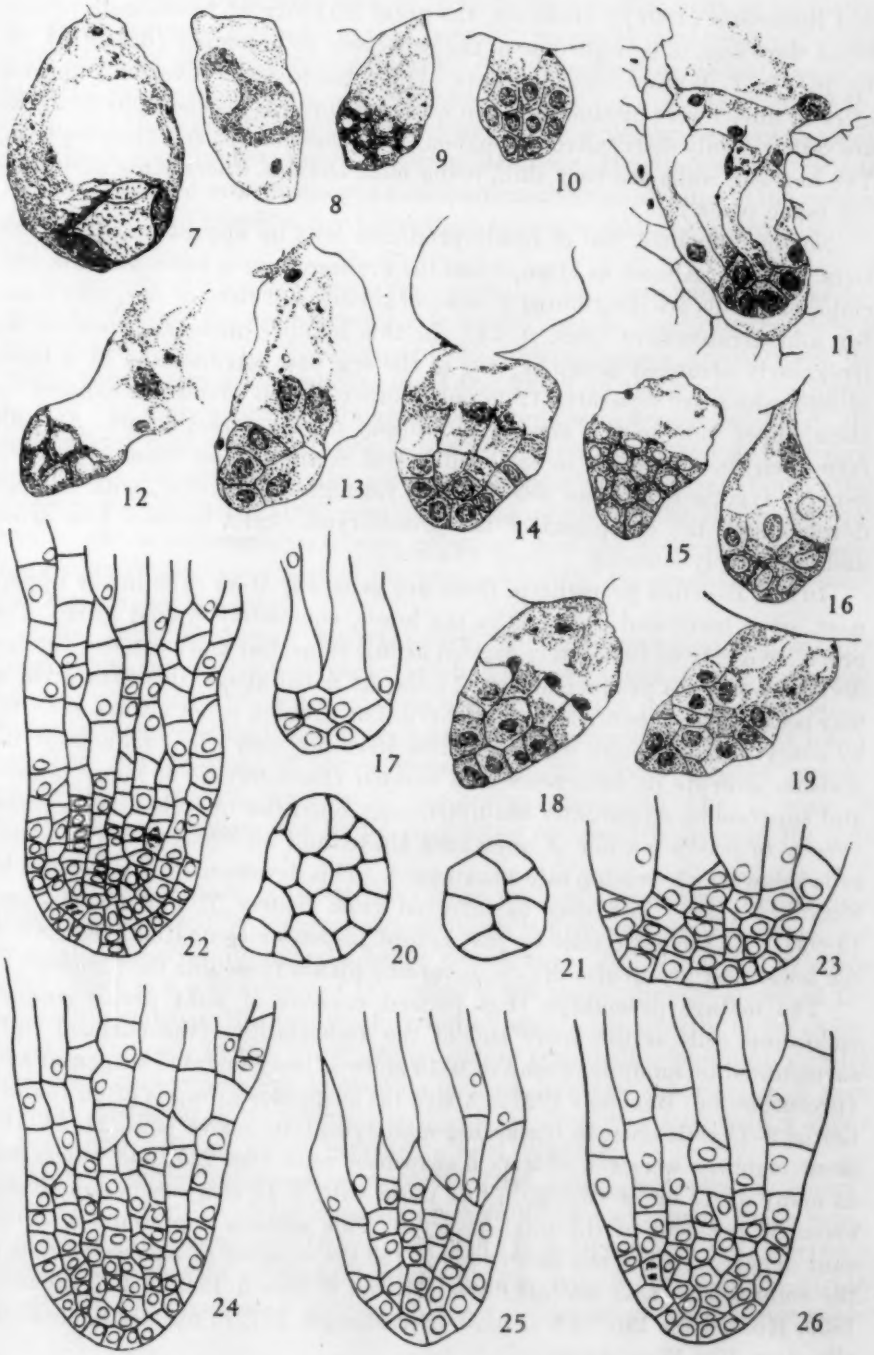
The following divisions result in the irregular dispersal of the nuclei in the proembryonic cytoplasm. No walls are produced in these early divisions, and spindle fibers are usually not observable after the nuclei have been reconstituted. When eight free nuclei have been formed, there is little uniformity in their position. They appear to be randomly distributed in the egg base. In one case, the eight nuclei and the accompanying cytoplasm extended along one side of the archegonium from its base to a point near the neck. At this stage the nuclei are considerably smaller than those of the binucleate stage, a phenomenon also described in other conifers. The nuclei become still smaller after the next free nuclear division, which gives rise to 16 nuclei. These, with their associated cytoplasm, occupy the lower one-third of the archegonium, and their arrangement is again quite variable.

Cellular Stages of the Proembryo. After the production of 16 nuclei, walls are usually formed. There is no gradual retention of initially ephemeral cell walls with each successive nuclear division, as Chamberlain (1910) found in the proembryo of *Dioon*, nor were the transitory cell plates mentioned by Jäger (1899) seen during earlier divisions. Most preparations show the new walls forming on fibers which extend between all the nuclei, as though consequent on the fourth nuclear division (figs. 9, 12). The existence of cytoplasmic fibers, on which walls are formed, is apparently characteristic of many other conifers but has not been noted in all cases.

Some proembryos may form walls after another division which produces 32 nuclei (fig. 15). [This has also been reported in *T. baccata* by Jäger (1899)

Explanation of figures 7–26

All figures, save 20 and 21, are median longisections, and all are magnified × 205. FIG. 7. Male and female nuclei in contact at base of egg. FIG. 8. Binucleate proembryo at center of egg. FIG. 9. Walls forming in 16-nucleate proembryo. FIG. 10. 16-celled proembryo. FIG. 11. Very young embryo showing start of suspensor elongation. Note open cells above suspensors. FIG. 12. Walls forming in 16-nucleate proembryo. FIG. 13. 16-celled proembryo. FIG. 14. 32-celled proembryo. FIG. 15. Walls apparently just formed in 32-celled proembryo. FIG. 16. 16-celled proembryo. FIG. 17. Embryonic group at tip of elongating prosuspensor. FIG. 18. 32-celled proembryo with walls of open tier clearly coincident with those of prosuspensor tier. FIG. 19, 32-celled proembryo. FIGS. 20, 21. Cross sections of prosuspensor groups in young embryos. FIGS. 22–26. Semidiagrammatic drawings of embryos in stages of development from that of the embryonic group's first divisions to that just prior to differentiation of the stele promeristem and root generative meristem.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and Robertson (1907)]. However, the great majority of 16-nucleate proembryos were seen to be walled or in the process of so becoming (figs. 9, 10, 12, 13, 16). In *T. Wallichiana*, Sugihara (1945) found walls invariably formed after 16 nuclei were produced. When walls are formed, the sporophytic nuclei are rather evenly distributed throughout the dense mass of zygotic cytoplasm. The new cell walls are very thin, being most obvious where some shrinkage has taken place.

Not infrequently, the 16 newly-produced cells lie approximately in two tiers (fig. 12). Almost as often, when the archegonium is narrower, the proembryonic cells are distributed in several superposed tiers of irregular number and arrangement (figs. 9, 13). In this manner there is produced an irregularly arranged group of cells in the egg base, surmounted by a layer of cells which are separated from one another by cell plates but exposed on their upper side to the general cytoplasm of the archegonium. At wall formation the cytoplasm in each cell is still essentially as dense as was the general zygotic cytoplasm prior to cell formation. However, with further development, the cytoplasm of the proembryonic cells becomes less dense and less deeply-staining.

In the 16-celled proembryo, there are generally 9–13 cells in the uppermost, open layer and 3–7 cells in the lower, completely walled group. The proembryo may be completely formed at this stage, but more often, a further division occurs to produce about 32 cells. As noted above, this fifth division may occur in the free nuclear proembryo. The division is not always executed by every cell. Although mitotic figures were not seen, the products of the division indicate its occurrence in a manner characteristic of many taxodes and cupressads. Apparently the uppermost, open tier of cells divides transversely to produce a tier of open cells above, and an equal group of closed cells below which develop into a suspensor. (This development is described by Sugihara (1945) and may be inferred from figures 57 and 65 of Jäger (1899).) At the same time or just before suspensor elongation, the cells of the lowermost group also divide in various planes to double their number.

The mature proembryo thus formed consists of 6–14 deeply-staining embryonic cells at the lower end of the archegonium (the chalazal end), surmounted by an upper group of 9–13 more or less elongated suspensor cells (prosuspensor: Buchholz 1929). Above the suspensor group is often found a tier of 9–13 cells open to the archegonial cytoplasm above (figs. 11, 14, 18). Some embryos were found with 6 suspensor cells (fig. 21), and others had as many as 17 or 18 (fig. 20); but those with 9–13 suspensors constituted about 80 per cent of the total observed. This number represents a significant departure from the figures given for the number of suspensor cells in the embryo of *Taxus baccata:* 5–6 (Mirbel & Spach 1843); 4–6 (Schacht 1850, Hofmeister 1862); 6 at most (Strasburger 1872); usually 6, occasionally 8 or 10 (Jäger 1899).

A few proembryos were seen to lack an open tier of cells at maturity. In others, there were present in this "relict" (rosette?) tier occasional closed cells (fig. 19) and even free nuclei. In those proembryos which appear to lack the rosette tier, there may have been an earlier disintegration of the open cells than usual. On the other hand, these proembryos may possibly have been organized in the 32-nucleate condition. It is interesting to note that one 16-celled proembryo was found oriented perpendicular to the normal direction, so that the open tier faced the side rather than the micropylar end of the prothallus.

Commonly the mature proembryo occupies the lower half of the archegonium. Toward the neck, several free nuclei may be found in the general archegonial cytoplasm. These nuclei, the supernumerary nuclei from the pollen tube, eventually disintegrate. In addition to the nuclei, the upper half of the archegonium includes some cytoplasmic remnants. As in the unfertilized eggs (Sterling 1948), this upper region of the archegonium is filled by the growth of the surrounding cells of the prothallium after the embryo elongates. These continually enlarging cells at the micropylar end of the megagametophyte also grow up over the archegonia and into the tissues of the upper part of the nucellus, giving the prothallus a broad, flattened, dome-like apex.

The Early Embryo. Shortly after the organization of the mature proembryo, the suspensors begin to elongate. Although a slight amount of elongation already occurs in these cells during the proembryonic stage, the subsequent elongation is quite marked. The proembryo stage is terminated by the thrusting of the embryonic cells downward into the gametophyte tissue through the base of the archegonium (fig. 11). It may be noted that one embryo was found elongating horizontally, toward the side of the prothallus.

As in many other conifers, the future path of the embryo in the prothallus is prepared by longitudinal divisions which produce a central tract of small, densely-staining cells below the embryo. Following this development, there is a dissolution of the cells in this tissue slightly ahead of the advancing embryo. Meanwhile, the prothallus enlarges greatly at its chalazal end. The cells in this lower region divide repeatedly, becoming smaller and more numerous. The gametophyte thus becomes spherical and then prolate. A coaxial development (fig. 5) at the basal end soon brings about a pear-shaped form, which persists to seed-ripening.

During initial suspensor enlargement, the densely cytoplasmic embryonic cells at the tip of the suspensor group remain quiescent while being carried into the endosperm (figs. 17, 27). The first divisions in the embryonic group occur shortly afterward. Although the cells at the surface divide mostly by periclines and anticlines, the cells adjacent to the suspensor

divide principally by walls perpendicular to the long axis of the suspensor (figs. 23, 25). The products of these latter cells eventually elongate in succession as they are formed (figs. 6, 24–26, 35). These may elongate while the prosuspensor cells are still relatively short (figs. 29, 31, 32) or only after pronounced elongation of the latter (figs. 30, 34).

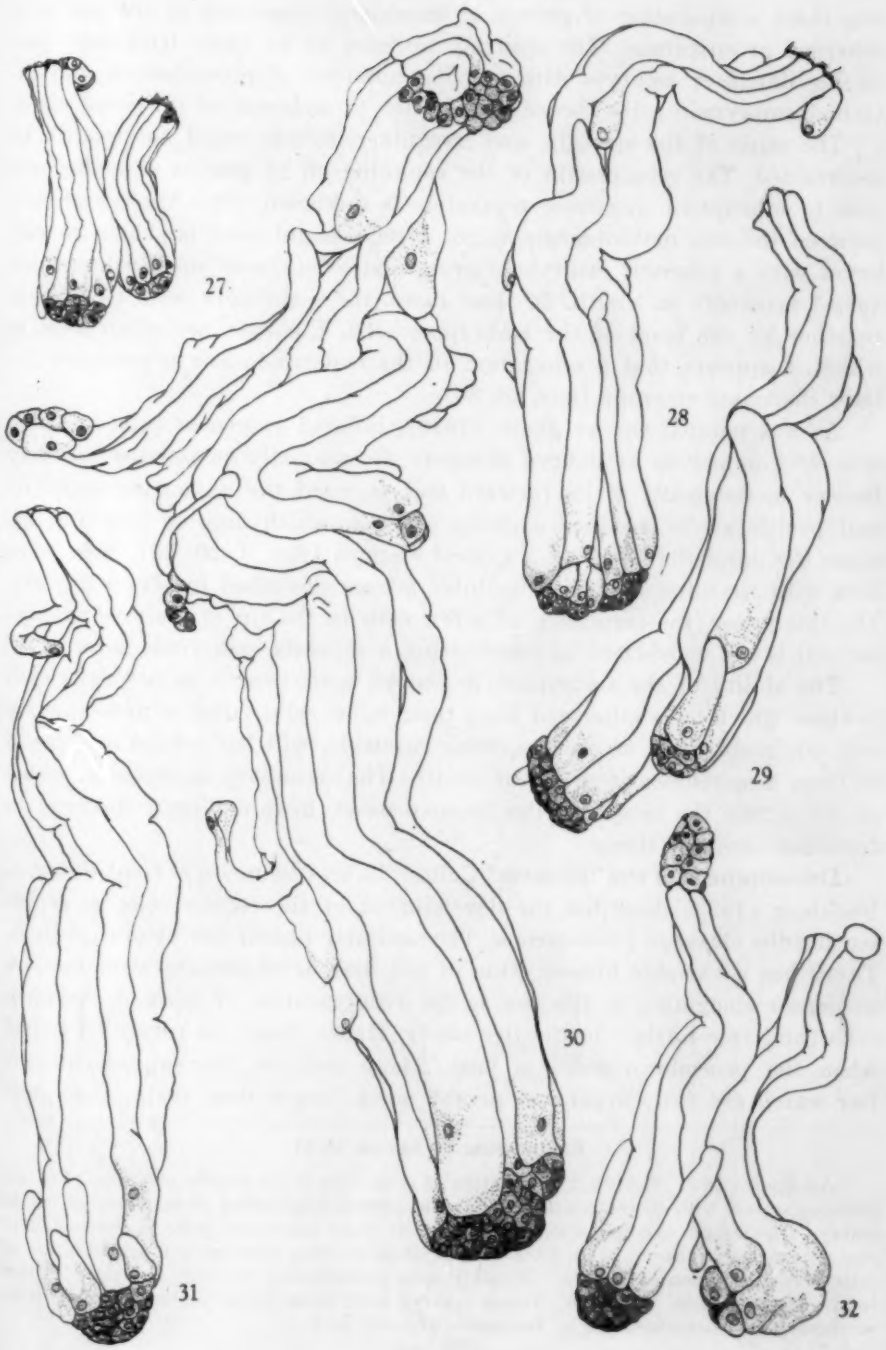
Rarely, however, do the secondarily produced suspensor cells attain the length of the prosuspensors. Although most of the prosuspensors elongate in unison and present a tiered configuration, the secondary suspensors are formed in irregular order and elongate autonomously, being produced independently by individual embryonic cells next to the prosuspensors. While elongating, the prosuspensors enlarge continually at their forward ends and experience a pronounced increase in diameter. The nucleus and most of the cytoplasm of a prosuspensor cell is to be found at its growing forward end.

Embryonic Cleavage or "Budding." As the prosuspensor develops, one or commonly more of its cells may not keep pace with the others and may separate from the main mass. Although these cells can elongate further, they no longer contribute to the main thrusting action of the group. When such a group of prosuspensor cells separate, they usually bear a few embryonic cells attached to their forward ends (figs. 29, 30, 32, 34, 36, 37). Ultimately, these embryonic cells form a meristematic group resembling that of the original embryo. Thus occurs a cleavage or splitting, resulting in the usual production of from two to four embryos, each consisting of embryonic cells borne on several prosuspensor cells.

Although cleavage (budding: Thomson 1945) of the embryo system is neither as regular nor as precise as that of pine, it occurs in a significant percentage of embryos. Approximately 30 per cent of the embryo systems showed such a cleavage. This development has also been figured in *Taxus baccata* by Mirbel and Spach (1843) and mentioned by Hofmeister (1862) and Strasburger (1872). It is interesting to note that wherever cleavage did occur, it involved the separation of prosuspensor cells. In no instance

Explanation of figures 27–32

All figures × 72. FIG. 27. Two young embryos wih some cellular development in the rosette region. The embryonic group at the growing end shows little activity. FIG. 28. Embryo showing different rates of elongation in isolated prosuspensor cells. Note start of cleavage in embryonic group. FIG. 29. Stage in embryo development just subsequent to that in figure 28, with cleavage of the prosuspensors and the embryonic group. FIG. 30. Extremely varied development of different regions of embryo. Particularly shown are cleavage "embryos," rosette cells persisting, with probably some multiplication, and indications of cleavage in main embryonic group. FIG. 31. Embryo without rosette cells or cleavage. FIG. 32. Embryo with some suspensors separated at right, with attached embryonic cells organizing a new meristem. (Separation of upper ends of suspensors artificially produced.) Configuration of rosette group seems to indicate its formation within the archegonium.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was there a separation of groups of secondary suspensors at the end of a coherent prosuspensor. The splitting appears to be quite irregular, producing daughter embryos with varying numbers of prosuspensor and attached embryonic cells—hence giving rise to embryos of different vigor.

The cause of the sporadic and irregular cleavage could not readily be ascertained. The relationship of the rounding off of groups of embryonic cells to subsequent suspensor separation is unknown. That the correlation between the two developments is not always maintained is shown in embryos with a coherent embryonic group extending over suspensors which varied markedly in length. In these cases, the suspensors seem to be held together by the bond of the embryonic cells. Embryos are often seen in which it appears that a separation in the embryonic group presages the later suspensor cleavage (figs. 28, 30).

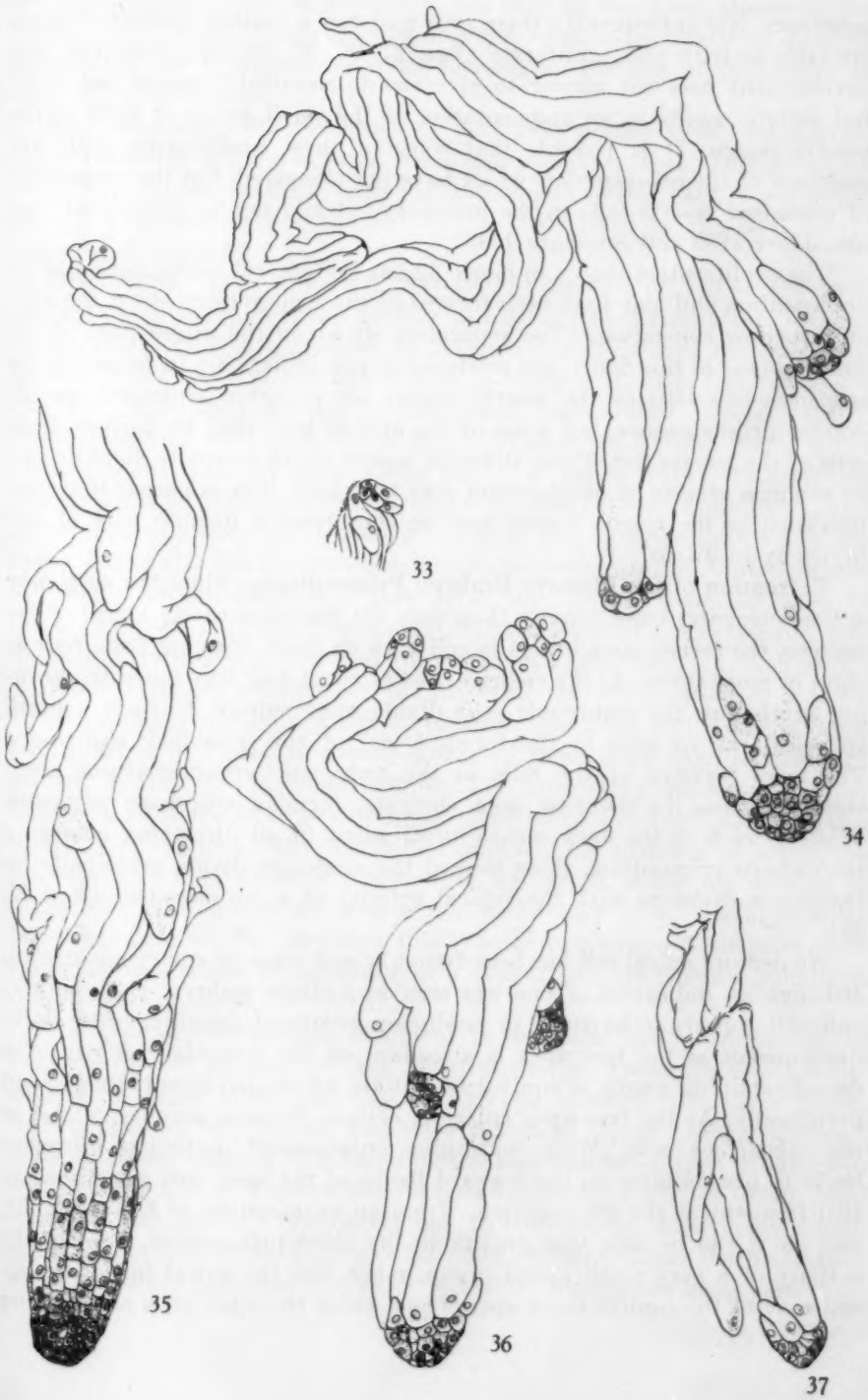
As was pointed out by Jäger (1899), isolated suspensor cells are likewise very numerous in embryo ontogeny. Occasionally an isolated cell may become meristematic at its forward end (toward the advancing embryo) and proliferate to produce a group of cells, which may or may not assume the parabolic shape of a typical embryo (figs. 4, 30, 36). Few were seen with the internal seriate cellular masses described by Jäger (1899). (In this paper, the formation of a few cells in the tip of a single suspensor cell is not considered as constituting a separate embryonic group.)

The ability of the suspensors to become meristematic is not restricted to those which have separated from their sister cells. Often a prosuspensor cell, while still part of the suspensor ensemble, will lag behind and begin to form a meristematic group at its tip. The secondary suspensors, which do not attain the length of the prosuspensors, have not been observed to form meristematic tissue.

Development of the "Rosette" Cells. In his discussion of *Cephalotaxus*, Buchholz (1925) describes the development of the rosette cells as representing the cleavage phenomenon. The similarly placed tier of open cells in *Taxus* has a variable history. One of the first developments attendant on suspensor elongation in the yew is the disintegration of most of the open cells (and free nuclei) in the tier above. Hence these can rarely be found when the proembryo stage is past. Those cells of the supra-suspensor tier which are fully organized persist much longer than their incomplete

Explanation of figures 33–37

All figures × 72. FIG. 33. Proliferation of some cells in the rosette position. FIG. 34. Embryo system with three terminal embryonic groups originating from cleavage in one embryo from single zygote. FIG. 35. Embryo at stage somewhat prior to formation of root generative meristem. FIG. 36. Embryo system showing cleavage and proliferation of cells in rosette region of embryo. Possibly some prosuspensor cleavage and proliferation is also involved here. FIG. 37. Young embryo split from larger embryo system. Note small suspensor branch cut off by formation of a cell wall.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neighbors. Not infrequently these cells undergo a limited amount of meristematic activity and proliferate (figs. 27, 30, 32, 33, 36). However, this development does not appear to give rise to so-called "rosette embryos" but merely results in an augmentation of the small group of cells in the rosette region. It is possible that some of these proliferative cells are members of the prosuspensor which have not elongated, but the occurrence of organized rosette cells in the proembryo should not be overlooked (see also Jäger 1899 and Sugihara 1945).

The proliferation shown in figure 32 has the general configuration of an archegonium and may have been formed in the archegonium about the time of suspensor elongation. (The separation shown in the upper part of the prosuspensor in this figure was produced in manipulation.) In figure 36, the suspensor-like cells in the rosette region are probably separated, proliferating prosuspensors, but some of the groups here may be derived from cells of the rosette tier. Thus, although rosette development is sporadic and no common scheme of development may be found, it is apparent that proliferation in the rosette region may be considered a definite part of embryogeny in *Taxus*.

Formation of the Massive Embryo Primordium. Since the suspensor system elongates more rapidly than does the corrosion cavity ahead of the embryo, the former soon begins to coil back on itself, forming from four to eight or more turns. As the embryo reaches about half way down the growing prothallus, the embryonic cells divide more rapidly to form a hemispherical cap of cells at the forward end of the secondary suspensors. The more forward of the cells in the embryonic group continue meristematic; those in the rear soon elongate, forming suspensor segments. While growth at the apex occurs by divisions in all directions, enlarging the embryo primordium, those toward the suspensor divide principally by transverse divisions with the typical activity of a rib meristem (figs. 22, 35).

No definite apical cell has been found at any stage in embryonic growth although an indication of one was seen in a single embryo. Each embryonic cell appears to be active in producing groups of daughter cells. Early development at the free apex is attendant on the irregular activity of a densely-staining group of equivalent initials, which divide anticlinally and periclinally. As the free apex enlarges, oblique divisons may occur also in the subsurface cells. With continuing enlargement, anticlinal divisions begin to predominate on the forward flanks of the apex, but periclines are still frequent at the very summit. From an examination of figures 22, 24, and 26, it can be seen that growth in the older primordium involves the activity of a very small apical group, much like the apical initial-mother cell zone of the conifer shoot apex, from which the other cells of the shoot

are produced by divisions parallel to the base of this zone. However, the initial group in the *Taxus* embryo does not seem to be lightly-staining or large-celled nor to possess the other histological features of this group in the conifer shoot apex.

Soon afterward, differentiation of the "stele promeristem" takes place in the relatively undifferentiated meristematic embryo apex. This occurs by specifically oriented cell divisions just subsequent to the stage shown in figure 22. This further development will be considered in the late embryogeny of *T. cuspidata.*

Discussion. It is apparent that the proembryo of *Taxus* enjoys a general organization common to that in most of the Taxodiaceae, Cupressaceae, and even Podocarpaceae, if the unique and delayed cytokinesis of the embryonic cells in the last family is overlooked. [Cf. *Cunninghamia* (Miyake 1910; Sugihara 1941), *Taxodium* (Coker 1903; Kaeiser 1940), *Sequoiadendron* (Looby & Doyle 1937), *Podocarpus* (Coker 1902; Stiles 1912; Sinnott 1913; Tahara 1941; Looby & Doyle 1944), *Saxegothaea* (Doyle & Looby 1939), *Juniperus* (Nichols 1910), *Biota* (Cook 1939), and *Libocedrus* (Lawson 1907) among others.] The principal difference between *Taxus* and the first two families lies in the number of nuclei present at wall formation, which is at least 16 in the yew and generally eight in the taxodes and cupressads. Nichols (1910) has found the occasional production of 16 nuclei before wall formation in *Juniperus.*

Apart from the number of cells involved, the organization of a lower group of embryonic cells, a tier of prosuspensor cells, and a tier of open cells is basic to *Taxus* and most genera of these three families, and the manner of their origin is also similar. The proembryo exhibits a distinct difference from the more precisely organized ones of *Sequoia* and the callitroids. Save for its greater number of cells and the presence of a cap, the proembryo of *Cephalotaxus* is somewhat similar. It is not too difficult to derive the more specialized proembryo of *Torreya* from this apparently basic organization. The fact that this type of proembryo is common to so many families might be advanced as a support for its possible primitiveness in the Coniferae.

The type of development exhibited in the usual early embryogeny of *Taxus cuspidata* appears to vary between that of *Taxus baccata* (as described by Jäger 1899) and that of *Torreya nucifera* (Buchholz 1940). Although many embryos are like those shown by Jäger (1899), with isolated suspensor cells, a significant percentage exhibit a type of development close to that of *Torreya nucifera,* as figured by Buchholz (1940), and somewhat like that of *Cryptomeria* (see Lawson 1904b). The type of cleavage is unlike that in the *Torreya* of Tahara (1940) because the prosuspensor cells, rather than the groups of secondary suspensors alone, are sepa-

rated. Whether this type of cleavage is classified as advanced or primitive depends on the phylogenetic status assigned to cleavage polyembryony. If, as has been indicated by recent investigators, cleavage is considered a derived condition, the precision and extent of the process would appear to be a more recent acquisition. Consequently, the type of cleavage in the Torreyas would be more advanced than that in *Taxus*. Such higher status of *Torreya* would accord with the evaluation of Buchholz (1940), based on other morphological factors.

The variable development of the open cells above the prosuspensor is similar to their behavior in the embryos of *Sciadopitys* (Buchholz 1931), *Sequoiadendron* (Looby & Doyle 1937; Buchholz 1939), *Podocarpus* (Buchholz 1936, 1941), *Saxegothaea* (Doyle & Looby 1939), and perhaps in *Torreya* (cf. Tahara 1940 and Buchholz 1940) and *Austrotaxus* (cf. Saxton 1934 and Buchholz 1940). It should be recalled that Jäger (1899) occasionally found cells in the rosette position in the proembryo of *Taxus baccata*. In *Taxus Wallichiana*, Sugihara (1945) reported the usual formation of completely walled rosette cells, with the occasional production of open cells. However, the fact that proliferation may take place in these cells is no indication that they are actually embryonic (see Thomson 1945). Except for a possible development shown in fig. 36, none of the rosette proliferations were definitely seen to form embryos differentiated into suspensors and embryonic cells, nor did the groups ever develop the structure of typical embryo apices.

The data on early embryogeny in *Taxus* may help to establish its position within the Taxaceae. It is clear that much of the embryology of *Austrotaxus* (Saxton 1934) places it in a lower rank of the family: the possible presence of a ventral canal nucleus, the possession of a well-defined layer of jacket cells, and the formation of several vegetative nuclei in the pollen tube. To these might be added the unique presence of a nucellar vascular system (Sahni 1920). (The large number of neck cells in the archegonium is a moot consideration.) On the other hand, on the basis of various factors already enumerated by Buchholz (1940), the highest ranking of the three genera is *Torreya*. It is of interest to note that in general, from *Austrotaxus* to *Taxus* to *Torreya*, there is an increase in the incidence, as well as precision, of cleavage in early embryogeny.

Comparing the proembryos of *Taxus cuspidata* and *T. baccata*, it is to be seen that the former has a much larger number of cells, approximately twice that in the European yew. Possibly the proembryo of the latter may be fully organized at the 16-celled stage (with exceptions as noted above). On the other hand, the more common situation in the Japanese yew is a 32-celled proembryo, with occasional 16-celled proembryos formed. This difference may be reflected in the number of prosuspensor cells organized

in each: about 6 in *T. baccata,* as contrasted with almost double that number as an average in *T. cuspidata.* Data are still too limited for any attempt to correlate the considerable frequency of cleavage in the Japanese yew with its large number of proembryonic cells. It should be noted that Sugihara (1945) describes an increase in the number of prosuspensor cells after their organization as a result of a longitudinal division in the cells of the original prosuspensor tier. Such a development is comparatively rare for conifers.

The absence of an apical cell in the embryogeny of *T. cuspidata* conflicts with the observations of Strasburger (1872), Jäger (1899), and Kapfer (1935) on *T. baccata.* However, the fact of its presence or absence is of relatively little significance in phylogeny, as has been well shown by R. B. Thomson (1945). Strasburger arrived at the same conclusion in 1879: "Nun zeigt auch das Beispiel von *Pinus Strobus,* wie wenig die Scheitelzelle an Coniferenkeimen zu deren phylogenetischer Gruppirung verwendet werden kann."

SUMMARY

After the sexual nuclei meet in the center of the egg, they usually sink to the base where they may form a resting nucleus. Free nuclear divisions follow to produce an irregularly arranged group of at least 16, and occasionally 32, nuclei before wall formation occurs. The walls are formed on cytoplasmic fibers between the nuclei, producing a variable number of enclosed cells in the base of the archegonium, surmounted by a layer of cells which are walled off from each other but exposed above to the general egg cytoplasm. Another division follows to produce about 32 cells, consisting most commonly of 9–13 open cells (rosette), 9–13 suspensor cells (prosuspensor), and 6–14 embryonic cells at the base.

After suspensor elongation, varying numbers of prosuspensor cells may separate from one another, with or without embryonic cells attached to their tips. More often, the embryo develops without such cleavage. Separated groups of cells produce embryonic assemblages of varying sizes and vigor; separated single prosuspensor cells may experience a certain amount of proliferation. In the rosette region, the open cells generally disintegrate, but some which are completely walled may undergo a limited series of divisions. Also in this region, non-elongating suspensor cells can proliferate actively.

The embryo primordium gradually becomes massive by periclinal and anticlinal divisions at the free apex, while rib-meristem activity behind the apex contributes to its mass as well as to that of the suspensor.

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EXPERIMENTS UPON THE REGENERATION OF CERTAIN SPECIES OF PELTIGERA; AND THEIR RELATIONSHIP TO THE TAXONOMY OF THIS GENUS

JOHN W. THOMSON, JR.

During the course of studies on the lichen genus *Peltigera* in preparation of a paper on the North American species of this group it became apparent that there was a curious sequence of species which paralleled another group of species in all characters save one, the possession of isidia. Thus *P. praetextata* has isidia but *P. canina*, its counterpart, does not; *P. zopfii* has isidia but *P. horizontalis* does not; *P. microphylla* has isidia but *P. polydactyla* does not. In most groups of lichens, the presence of isidia is in the present day concepts regarded as sufficient to delimit species. For example, monographs of *Parmelia* by Tavares, of *Alectoria* by Du Rietz, of *Usnea* by Motyka and papers by many other lichenologists accept the presence or absence of isidia as good characters for the separation of lichen species. In the genus *Peltigera* this concept has been carried out to its fullest extent in the many and scattered writings of V. Gyelnik (6–12).

Examination of the many specimens necessary for the preparation of a paper on the North American species led to the following observations: (1) *P. evansiana* Gyel. has cylindrical isidia which are not particularly associated with cracks or holes in the thallus or with the thallus margins and are scattered over the upper surface. (2) Specimens of other species, those in the second column of table 1, have isidia of quite different character. They are flattened and, more significantly, they are grouped closely around holes, cracks and breaks in the upper surface or on the margins, only occasionally being scattered over the surface. (3) A third, peltate, type of isidium is present in *P. lepidophora*.

The isidia of some species of *Peltigera* have been quite thoroughly studied. Nilson (16) mentioned isidia along with soredia saying that their production is dependent upon the environment and that individuals bearing such structures should be termed forms rather than species. Strato (17) regarded the isidia as regeneration structures in *P. canina* as a result of his experiments with plants under bell jars. He found that light, a moist atmosphere and a substratum of earth or moist clay were necessary to produce regeneration. Linkola (13) also experimented upon the same plant, under the name *P. praetextata*. He observed plants in the open for two years and found that isidia were formed only where two years previously artificial cuts had been made. The fact that regeneration followed wounding should not be surpris-

ing but Linkola claimed that the development in this case is unique and met with only in *P. praetextata* and not in *P. canina*. Darbishire in one paper (2) expressed a doubt as to the validity of *P. praetextata* as a species, calling it a form or state of *P. rufescens*, although in a later paper (3) he called it a species. He called attention to the fact that the isidia are associated with cracks and affirmed the view that they are "largely organs of assimilation." Du Rietz (4) has given us the term *squamiformia* to describe the type of isidia in *P. lepidophora* and in *P. praetextata* as he called it. In the papers of Gyelnik are many "species" characterized by the presence of isidia. He has accepted the premise that isidia are good characters for the differentiation of species of *Peltigera* and has described, as Magnusson (15) put it ". . . eine Fülle von arten, deren Zähl wir noch nicht kennen." To find, as Magnusson points out, a single isidium on a thallus would mean that one would have to shift the classification of his specimen into the group with isidia.

The examination of herbarium specimens left me with the opinion that the isidia of the species of *Peltigera* other than *P. evansiana* and *P. lepidophora* were probably nothing but normal regeneration of the common species. In order to decide this point to my own satisfaction, experiments were set out during the summer of 1946 in the Brule River valley in Douglas County in Northern Wisconsin. Here several species of *Peltigera* were available in undisturbed natural condition. Plants of *Peltigera canina* and its var. *rufescens*, *P. horizontalis*, and *P. polydactyla* were observed at several stations. Some lobes were cut with a scalpel, "UW" being cut through the younger lobes. Other lobes were crushed by stepping on them to simulate the damage that might be done by deer, rabbits, squirrels, or other animals. A third set of lobes was left as controls. The location of each set of lobes was carefully noted.

One year later, during the summer of 1947, the experimental plants were reexamined. All the lobes which had been crushed in each of the three species had regenerated freely, with an abundance of the characteristic squamiform isidia. The undisturbed controls remained unchanged except for having grown larger during the year. The lobes which had been cut with the initials "UW" were not so uniform; some of them had regenerated profusely along the edge of the cuts, others not at all, even on the same thallus.

It does not seem reasonable that some parts of one thallus are an isidoid "species" and other parts a non-isidoid species. But this would be the conclusion necessary if one would follow Gyelnik's keys to *Peltigera*. One comes to the conclusion that the isidia, at least in the three species experimented upon, are regeneration phenomena worthy at most of recognition as forms if one follows the current practice, as in the *Cladoniae*, of giving such trivial variations nomenclatorial recognition. The ordinary expansion and contrac-

tion of the thallus with changes in the moisture content are often sufficient to produce the cracks and initiate the formation of the isidia. In specimens one often sees clusters of isidia around the holes produced by snails or insects feeding on these lichens. The fact that specimens of *P. canina* f. *innovans* growing on rounded boulders in woods are frequently isidoid suggests a link with the feeding habits of squirrels and chipmunks. In clambering to the tops

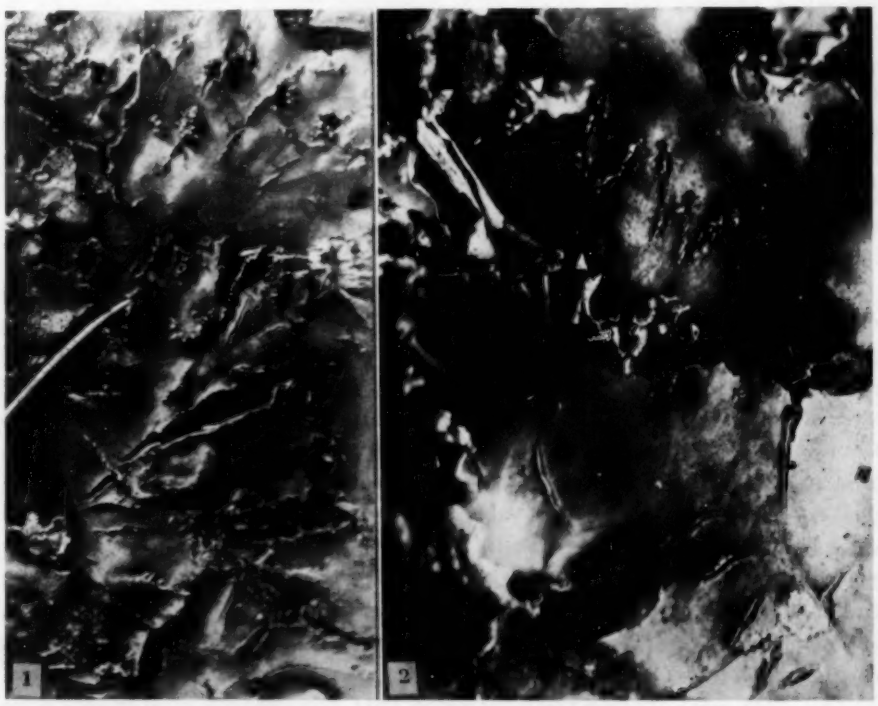

FIG. 1. *Peltigera canina* showing the abundant formation of regeneration squamules or "isidia" one year after the gross wounding of crushing. ×3. FIG. 2. *Peltigera polydactyla*. Two lobes on the same piece of thallus cut by a scalpel in the initials "UW"; regeneration squamules formed along the cuts on the upper lobe and little regeneration on the lower lobe. ×3.

of the boulders the animals are likely to cause damage to the thallus, with consequent regeneration.

The cleanness of the cut and the resultant amount of wounding may explain the inconsistency of regeneration following cutting with a scalpel. Both Linkola and I found that regeneration did not always follow such wounding. He interpreted his results as showing one species which regenerated and another which did not. My results, in which some lobes regenerated and others on the same thallus did not, would refute this idea, particularly

when the gross wounding or crushing was always followed by the formation of the regeneration lobes or isidia.

The isidia of *P. lepidophora* were thought by Bitter (1) to be cephalodia, the algae being derived from outside the thallus although also being of the same type as that of the thallus, i.e. Myxophyceae. Linkola (14), studying sections of the thallus, showed that contrary to Bitter's studies they are not cephalodia but that the algae come from the thallus. An excellent plate in Linkola's paper is very convincing for his view. Darbishire (2) and Goebel (5) reexamining the same species also supported Linkola's view. Strato (17) and Darbishire (3) have given descriptions of the formation of the isidia in *P. praetextata* (as they called it) and both showed that the algae came from the thallus; both also leaned to the opinion that moist conditions are most favorable for the growth of isidia. Darbishire gives a very good statement of the origin. A mass of hyphae just below or just within the algal layer be-

TABLE 1. *Regeneration Forms of North American Peltigeras*

Parent species	Isidoid "species"	Correct form name
P. canina (L.) Willd. including var. *rufescens* (Weis.) Mudd.	*P. praetextata* (Flk.) Vainio *P. subcanina* Gyel.	f. *innovans* (Körb.) Thoms.
P. horizontalis (Huds.) Baumg.	*P. zopfii* Gyel.	f. *zopfii* (Gyel) Thoms.
P. polydactyla (Neck.) Hoffm.	*P. microphylla* Gyel.	f. *microphylla* Anders
P. polydactyla or *P. horizontalis* but sterile and cannot be placed	*P. elisabethae* Gyel.	.....

comes meristematic and forms small knobs which contain a few algae. At first the knobs are continuous with the algal layer but ultimately these form the flat leaf-like or squamiform isidia which are more or less horizontal and oriented dorsiventrally. The cortex is continuous over both surfaces but Darbishire found the upper to be thicker, with a depth of two to three cells, whereas the lower is only one cell in thickness. Tobler (18) as well as Strato considered the algae to be the initiators of the formation of isidia; Darbishire regarded the fungal activity as the primary cause. Darbishire regarded the isidia as a device which increased the photosynthetic area and only accidentally functioned as organs of reproduction. To my mind they are, in most species, merely a response to injury and are not a normal development adapted primarily either for assimilation or reproduction although they may serve these functions.

It would thus appear that in *Peltigera* there are different types of "isidia" which may or may not be used as the basis of classification of species. In *P. evansiana* there are cylindrical true isidia which are not

associated with wounding and occur scattered over the thallus. The presence of these isidia, as in *Parmelia, Usnea, Leptogium* and *Alectoria,* is a good specific character. Likewise the peltate isidia of *P. lepidophora* may be considered as satisfactory for the delimitation of this species. In addition, neither of these two species of *Peltigera* has an analogous species which lacks isidia. However, the "species" listed in the second column of table 1 have isidia of quite a different character. As Du Rietz has pointed out, they are squamiform and oriented dorsiventrally. Furthermore, they arise as a result of wounding and the "species" bearing them are paralleled by a sequence of species which lack isidia but are otherwise similar. The isidia of these species are not true isidia but false isidia, arising as regeneration structures, and their presence or absence is not a good specific character.

The result of these experiments is summarized in table 1 in which the regeneration form is listed under the correct name as well as the incorrect "species" name, and the corresponding parent species is noted. For the extensive synonymy of these forms the writer's papers (19, 20) should be consulted.

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OVERSUMMERING AND OVERWINTERING OF THE CEREAL RUST FUNGI

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The annual recurrence of cereal rusts has attracted much attention throughout the world on account of the great losses caused by them in the production of cereals. The life cycle of most of these fungi is believed to develop on two hosts: the cereal and another alternate host. In some parts of the world the alternate hosts are undoubtedly indispensable for the completion of the life cycle and are important agents of epiphytotics, but apparently in the majority of countries the alternate hosts do not play the role which has been given to them. In Australia and South Africa there are no wild species of *Berberis* to serve as alternate hosts of *Puccinia graminis*, which nevertheless occurs annually with considerable severity. When the alternate hosts of the cereal rusts do actually occur, they are often not naturally infected or, if so, very slightly and at such periods that they cannot be made responsible with absolute certainty for transmitting the infection to the cereals.

The annual infection of cereals and of the alternate hosts has been attributed to one or more of the following causes: (1) to urediniospores or aeciospores which remained viable during summer and winter; (2) to resting mycelium which survived during unfavorable periods in volunteer cereals, in wild grasses, or in dead plant materials, and from which urediniospores are produced; (3) to resting mycelium which was able to live during summer and/or winter in the alternate host and from which aeciospores are formed; (4) to teliospores that remained viable and the basidiospores produced from them, which infect the alternate hosts on which aeciospores are produced; (5) to mycoplasm, mycelium, or urediniospores that remained in or on the seed; (6) to urediniospores or aeciospores which have been transported by the wind directly or in successive steps from localities in which either of these have remained viable or their production has been continued; (7) to teliospores or basidiospores which have been transported from other districts.

Of the investigators who have worked on rusts in Greece, Politis (1929) has studied the rusts which parasitize cereals and grasses in Attica. While he ascertained that *Berberis cretica* growing on Mount Parnes is attacked by *Puccinia graminis*, he believes that the presence of this host does not have the special significance which has been attributed to it by De Bary (1865) to *B. vulgaris* in transmitting the disease to cereals. Later, the same

author in collaboration with Maire (1940) published a treatise concerning the fungi occurring in Greece, among which are many species of Uredinales. According to Stakman (1923, 1934), who visited this country during the summer of 1922, the infection of cereals by stem rust in the plains probably comes on the one hand from the bushes of *B. cretica*, growing on the mountains, which he found severely infected, and on the other, from the urediniophase which oversummers on the susceptible grasses on the mountains. Each year, the urediniospores are transported by the wind to the plains where they infect the cereals and the wild grasses. The holding-over of stem rust in the uredinio-phase at lower altitudes is considered by him improbable, not so much because of the severity of winters, as because of the high temperature and dryness during summers, as a result of which it is impossible for the cereals and the majority of grasses to remain green and thus make it possible for the uredinio-phase to be propagated.

At the beginning of the study of the occurrence of cereal rusts, the alternate hosts were the subject of investigation. Of the cereal rusts known to have alternate hosts, including *P. graminis*, *P. triticina*, *P. simplex*, *P. coronata*, *P. dispersa*, and *P. sorghi*, the stem rust has *Berberis cretica*, growing at altitudes of 900–1500 m., as an alternate host, and *P. dispersa*, according to Politis (1929), completes its cycle on certain species of *Anchusa*. The other alternate hosts have not till now been found to be naturally infected, or are lacking. It has been ascertained that only a few teliospores of *P. graminis tritici*, kept under natural conditions, are able to germinate in the middle of April at a temperature of 18° C, and after remaining 5 days in a hanging drop, the basidia that were produced did not develop basidiospores. From the cereal rusts only the teliospores of *P. simplex* were found to germinate rather well at the end of April after remaining in a hanging drop for 12–48 hours. Basidiospores were produced or each of the four cells of the basidium formed a long hypha. Urediniospores of *P. graminis tritici* produced at the beginning of May germinated very well. On the contrary at the beginning of July freshly produced urediniospores have about 2 per cent germination. The average temperature in July, varying from 21.2° C to 32.5° C, is conducive to abundant production of urediniospores but is not favorable for their germination. In other words the stem rust produces urediniospores most of which are never able to germinate. The small proportion that can actually germinate lose their capacity for germination in 2 or 3 days. The duration of the germinating ability of urediniospores for the other cereal rusts is even smaller. It is not only in July that the temperature is very high; the whole summer is hot and dry and lasts from May to the middle of September and sometimes is protracted to the middle of October.

All of the possible ways of oversummering and overwintering of the

cereal rusts were put to test. The transportation of spores has been followed by means of spore traps.

Finally the conclusion was reached that none of the given explanations could be taken as satisfactory for the appearance of cereal rusts in Attica. By mid-April *B. cretica* is not infected by stem rust, while this and the orange leaf rust have been found on cereals as early as April 9. The rusts seemed to remain on the spot by some means other than the hitherto proposed means of propagation. Many things were suspected as having a connection with the rusts, especially those that fortuitously occurred with the rust pustules. Certain cells were particularly suspected as being responsible for rust infections in the spring and in order to prove this (later it was ascertained that these cells had no connection with the rust fungi), rust material was kept from one season to the other for inoculation tests. These tests involved the stem rust and the orange leaf rust, as these are the most abundant here. Spores were scratched from the infected leaves and culms, the dust thus derived being a mixture of urediniospores and teliospores of both rusts, together with other fungus and host material. There was no effort made to collect spore material separately from each rust as the main problem was to find out if they could be propagated by it. Spore material was kept from one rust season to the other in the following ways: (1) in a glass container held in a glass moist chamber; (2) on pieces of pith that were placed on moist sand in a glass chamber; (3) on pieces of culms with the leaf sheaths around them which were pinned on a block of wood and kept in a glass chamber that was kept moist. All chambers were kept under natural conditions. Also, (4) a bundle of severely infected plants was kept on the ground in a shady place in the open under a couple of stones. Under each of these four conditions of storage there was a variation in the degree of moisture but all were subject to the same variations in temperature during summer and winter. Infections from spore material kept under all four conditions were positive. Uredinia of *P. graminis tritici* and *P. triticina* were produced 8–10 days after inoculation on a susceptible wheat variety "pusa," both in young and advanced stages of development. Later telia were also produced. The first positive infection was observed on June 5, 1945. In 1946 the inoculations were made earlier and so more successful results were obtained from May 20 on, owing to the more favorable climatic conditions.

Under all four conditions of storage the material was pretty well decomposed, being infected during the year by various saprophytic fungi. Of the urediniospores only the walls still remained and of the teliospores the majority were destroyed. The production of infections in the spring by such material indicates that the means by which the rusts propagated have the ability to resist and survive.

These results lead to the conclusion that the cereal rusts in Attica propagate themselves by some means—other than the usual urediniospores or teliospores—that remain in the rust pustules. In nature, perhaps after it is detached from the pustules, it remains also on the ground. It is very likely that these facts hold true for other parts of the world. Of the actual means of propagation it is difficult to say anything at this time.

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THE NOMENCLATURE OF HYBRIDS

H. W. RICKETT AND W. H. CAMP

To a large extent the wording of the Rules of Nomenclature is an inheritance from the past. Successive conferences have added provisions, modified others, but have left much of the general structure unchanged. This is notably true of the parts dealing with "hybrids"—articles which preserve many of the actual words of Alphonse de Candolle written in 1867. Considering the vast strides which genetics has made in recent years, this stability of nomenclature merits attention. Sprague wrote in 1939 that "the present rules concerning hybrids (Art. 31–34) date essentially from 1905, having undergone but little change since then."[1] This is surprising enough. But still more surprising is another article which defines the categories treated in Articles 31–34; the wording of this article, basic to an understanding of the others, *has not changed significantly since 1867*. Here is the present English version:

> Art. 14. The fertilization of one species by another may give rise to a hybrid (*hybrida*); that of a subdivision of a species by another subdivision of the same species may give rise to a half-breed (*mistus*).

It is worthy of note that the French version has undergone more verbal change in these 80 years than the English, and that the latter, quoted above, is not an exact translation of the French. In 1867 de Candolle wrote: "la fécundation d'une espèce par une autre espèce, crée un hybride (*hybridus*), ..." The French text of the present *Rules* (ed. 3) has "La fécundation d'un végétal d'une espèce par un autre, se rattachant à une autre espèce, donne naissance à un hybride (*hybrida*)." The English wording indicates a certain disregard of fundamental biology, for it could be interpreted as meaning that all members of the several species or subdivisions may be involved. While such a mass-hybridization is perhaps theoretically possible, it would certainly be a remarkable phenomenon in the vegetable kingdom. Since the rules seek to bring precision to the practice of nomenclature, it is legitimate to expect that they be precise in their phraseology. *Individuals hybridize but species do not.*

Moreover, the sort of distinction that is here implied between species and their subdivisions has no place in modern biological science: it is not only pre-Mendelian in flavor, but even has a marked pre-Darwinian odor. Whether a population is a species or a subdivision of a species rests not on some absolute criterion, but upon empiric considerations such as morphologic stability, genetic behavior, geographic range. To set up, therefore,

[1] Chron. Bot. 5: 209.

two categories, "hybrid" and "half-breed," gives us a nomenclatural system which is at variance with the facts of nature as we understand them.

Article 31 adds to the confusion by appending still another category, "asexual hybrids (graft hybrids, chimaeras, etc.)," whose relation to the other two is hard to discern. This category *seems* to be a subdivision of "hybrids," and not to be found in "half-breeds"; it appears either that graft hybrids and chimaeras (to say nothing of "etc.") either do not occur among subdivisions of one species, or that if they occur they are not to be named. It is not, indeed, clear how such a mixture as a graft hybrid or a chimaera can be included in either category, hybrid or half-breed, since both of these are defined (in Art. 10) as the result of fertilization. Or is it possible that, as they are here used, these terms still preserve some taint of ancient folk-lore? For centuries vegetable chimaeras were thought to be the result of "hybridization," and the consideration of them in the same paragraph with "graft hybrids" leads one to the conclusion that those who tacitly accepted this juxtaposition in 1930 and again in 1935 still held to the medieval concept. The cytogenetic nature of both sectorial and periclinal chimaeras has been understood for many years; and modern genetics knows of no "hybridity" due to the grafting of plants.

What is a hybrid? We do not know just what the geneticist would reply to this question; very probably several geneticists would give several answers. The word has acquired much additional significance since its use in the middle of the last century. Then it was applied mainly to the first generation of "crosses," usually sterile or nearly so. Hybrids, in this sense, were often described by systematists; they were more or less intermediate in appearance between their putative parents, and could often be recognized by their sterility. Bentham in 1858 gave rules for the recognition of such hybrids ("anomalous specimens").[2] For example, Rowlee in 1891 used Bentham's rules in concluding that the plant known as *Solidago serotina* var. *gigantea* A. Gray was actually a hybrid between *S. serotina* and *S. canadensis*, the decisive factor being the absence of fertile achenes.[3] In this sense a hybrid was an occasional individual; it did not form a population, and presented no real problem in the taxonomic picture.

This view of hybrids is held chiefly by taxonomists concerned with exploratory studies, in which their knowledge of species is limited to specimens preserved in herbaria. The usefulness of such work cannot be denied, and much exploratory taxonomy still remains to be done. But the systematist working in regions which are better known is ready to make deeper inroads into an understanding of nature. Indeed this sort of attack is well under way; the cooperation of taxonomy, genetics, and cytology is

[2] Handb. Brit. Fl. 32, 33.

[3] Bull. Torrey Club **18**: 86, 87; **19**: 312.

a fact, not a hope for the future. Although the words "*mule* of florists" did disappear from this part of the rules between 1910 and 1930, perhaps indicating some slight awareness by taxonomists of a changed outlook in genetics, the astonishing thing is that a congress meeting in 1935 could still use almost the exact phraseology of 1867 and accept the implications thereof.

Let us look at only a portion of the record. In 1899 the sterile hybrid *Primula kewensis* appeared, was subsequently obtained by controlled crossings, and later gave rise to fertile plants. By 1929 the polyploid nature of this fertile material was understood.[4] In 1917 Winge propounded his hypothesis of the origin of new races by hybridization followed by chromosome doubling;[5] this received experimental confirmation in *Nicotiana* in 1925,[6] in *Viola* in 1926,[7] and by Karpechenko's well known *Raphano-Brassica* cross in 1927.[8] By the time of the 1930 Congress, then, it was well established that new, reasonably stable, fertile races could arise out of hybrids. The origin of species by such methods was conjectured in *Fragaria* (1926),[9] *Rubus* (1927),[10] *Dahlia* (1929):[11] and between the 1930 Congress and that of 1935 the number of species that had been shown to have had (or probably had) what is fundamentally a hybrid origin was further extended. Yet we read in Article 10 that "every individual plant, interspecific hybrids and chimaeras excepted, belongs to a species . . ." Unless we suppose that something other is here meant than the result of the "fertilization of one species by another," we must deny specific status to *Iris versicolor*,[12] *Galeopsis tetrahit*,[13] *Spartina townsendii*,[14] and many others whose hybrid origin is generally accepted. Or should we further obfuscate the situation by accepting them as polyploid "species," with no regard for their bispecific ancestry?

It is immaterial at this point what definition of "hybrid" may be finally approved by geneticists and biosystematists. The fact is that species can and do arise by hybridization and that polyploid forms derived in this manner have at least something in common with hybrids, however defined. The present provisions for the nomenclature of hybrids ignores these facts and can apply only to hybrids as understood by an earlier generation, a limited and nomenclaturally relatively unimportant class of phenomena.

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[4] Jour. Genet. **20**: 405–467, *pl. 11–13*.
[5] Medd. Carlsberg Lab. 13:
[6] Genetics **10**: 278–284.
[7] Hereditas **8**: 126–130, *pl. 2*.
[8] Zeits. Ind. Abst. Vererb.-Lehre **48**: 1–85.
[9] Genetics **11**: 590–604.
[10] Genetica **9**: 241–278.
[11] Jour. Genet. **21**: 125–129, *pl. 12*.
[12] Ann. Mo. Bot. Gard. **23**: 471–483, *pl. 23*.
[13] Hereditas **16**: 105–154.
[14] Genetica **12**: 531–538.

Hybridization among natural populations not only accounts for new and stable polyploid races, it creates other and more complex situations which do not involve the production of polyploids. In 1922 Jens Clausen estimated that there were 5,308,376 possible combinations of characters of two species of *Viola* which are known to interbreed freely in nature.[15] How many of these actually exist is not, of course, known; but we must be prepared for any number up to that limit. The rules of nomenclature provide that "when different hybrid forms of the same parentage (pleomorphic hybrids; combinations between different forms of a collective species, etc.) are united in a collective group, the subdivisions are classed under the binary name of the hybrid like the subdivisions of a species under that of a species." What the "binary name of the hybrid" can be in such cases is obscure, since there is not one hybrid but many thousands. But it is worth noting that Wittrock in 1896 applied regular taxonomic techniques to the group of variables in *Viola* above mentioned, naming them as varieties, forms, subforms, and so on—to the number of some 40 groups.[16] This leaves a possible 5,308,336 more to be named within this single hybrid complex by the taxonomists of the future, should they attempt to work under the present rules.

Proof is now available that hybridization can and does produce fortuitous combinations yielding individuals which are able to venture into habitats where neither of the parental types exists; these are often sufficiently fertile that extensive self-perpetuating (and ultimately reasonably stable) populations result (there are examples of this in *Vaccinium*, *Fagus*, *Quercus*[17]). Here no polyploid phenomena are involved; homoploid crossing provides only another of the various mechanisms of evolution. It has been obvious for some time that many species came into being in such a manner in the past; it is equally obvious that it is taking place today in many areas and in diverse groups. Yet the rules of nomenclature under which we now operate force us to ignore this common phenomenon, or to treat it in a wholly unrealistic or inadequate manner. A nomenclatural system must be flexible enough to permit the taxonomist to express, with clarity and precision, the complexity which he finds in nature.

It is now manifest that different kinds of species exist in nature, and subspecific groups that behave in many different ways. A little of this complexity which the taxonomist faces was pointed out by Camp and Gilly in 1943.[18] We have apomictic groups, often in great numbers or "swarms" (as in *Crataegus*,[19] *Crepis*[20]); hybrid swarms (as between *Viola*

[15] Bot. Tidssk. **37**: 363–416.
[16] Acta Hort. Berg. **21**: 1–142, *pl. 1–14*.
[17] Bull. Torrey Club **72**: 1–21; and unpublished work of W. H. Camp.
[18] Brittonia **4**: 323–385.
[19] Bot. Gaz. **97**: 780–793. Castanea **7**: 51–55.
[20] Carn. Inst. Wash. Publ. **504**: 1–199.

arvensis and *V. tricolor*[15]); heteromorphic auto- and allopolyploid series which are highly interfertile on the homoploid levels (as in *Vaccinium*[21]); polyploid races morphologically alike which will not interbreed (as in *Tradescantia*,[22] *Sedum*[23]); clines of all sorts (as in *Plantago*,[24] *Fagus*[17]); both small- and large-scale introgressions (as in *Tradescantia*,[25] *Quercus*[17]); and many other phenomena, such as aneuploid series derived by hybridization (as in *Erophila*,[26] *Carex*[27]). Perhaps no rules of nomenclature can serve us in describing and cataloguing such groups, unless the rules themselves become so complex that they defeat their purpose. A set of rules whose applications we attempt to define more and more strictly is certainly insufficiently elastic to adapt itself to the constant expansion of knowledge. And we must face the certain fact that our present knowledge is only a fraction of that yet to be uncovered concerning the extent and character of these phenomena.

However this may be, the present rules, which include provisions which do not, in fact, correspond with what we already know is to be found in nature and do not answer the present needs of the experimental taxonomist or biosystematist, should no longer be tolerated. It is probably beyond the powers of any one or two persons to propose rules to apply to these highly complex phenomena. The lack of proposals for the nomenclature of hybrids which Sprague mentions reflects this difficulty, but is neither a sufficient nor a valid reason for retaining the old rules, these being not only inapplicable and misleading, but based on conceptual error.

Since it is obvious that the portions of the present rules which have to do with "hybrids" and populations derived from hybrid materials are inadequate and need complete revision it is proposed that the ensuing International Botanical Congress establish a special committee charged with the duty of formulating a revision of these parts which will permit all systematists to attack their problems in the light of present knowledge. Such a committee should be composed of descriptive and experimental taxonomists and also include geneticists. Its task will be no easy one, for it will be turning totally new ground in the practice of nomenclature. The alternative is to admit that taxonomy in the traditional sense and modern experimental systematics (biosystematy) have nothing in common —a conclusion detrimental to both branches of biology.

THE NEW YORK BOTANICAL GARDEN
NEW YORK

NOTE: Since the above was written and sent to the printer, a symposium was held at Utrecht, under the auspices of the International Union of Biological Sciences, to discuss proposals made for changes in the rules of nomenclature. At this meeting the nomenclature

[21] Brittonia **5**: 203–275.
[22] Genetics **21**: 61–65.
[23] Am. Jour. Bot. **29**: 283–286.

of hybrids was briefly discussed and a committee was formed to study the matter and to make recommendations to the International Botanical Congress in 1950. The junior author of the present paper was named secretary of that committee, and would be pleased to receive communications on the subject from readers who are interested in it.

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[24] New Phytol. 38: 293–322.
[25] Ann. Mo. Bot. Gard. 23: 515–525.
[26] Medd. Carlsberg Lab. 23: 41–74.
[27] Hereditas 5: 129–216. Brittonia 4: 340.

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SYNERGISM BETWEEN SOME ANTIBACTERIAL SUBSTANCES[1]

WILLIAM J. ROBBINS, FREDERICK KAVANAGH AND ANNETTE HERVEY

In the course of an investigation of antibacterial substances produced by some Basidiomycetes, phenomena were observed which indicated that the activity of one antibacterial substance might be enhanced by the presence of a second antibacterial substance.

The results to be described were originally observed when agar discs containing an antibacterial substance or discs cut from fungus colonies growing on an agar medium were placed on yeast-peptone agar, seeded with the indicator bacteria, at such distances that the zones of antibacterial action produced by the discs touched or merged. In addition to the observations made on agar plates, experiments were conducted in broth cultures as described below.

Methods and Materials. The indicator organisms included *Staphylococcus aureus* (H), *Sarcina lutea, Bacillus subtilis,* and *Bacillus mycoides.* The antibacterial substances were penicillin, streptomycin, and streptothricin, which were incompletely purified materials kindly supplied by Merck & Co., Inc.; an antibacterial substance from burdock (*Arctium minus;* 2) obtained from Dr. J. H. Bailey; patulin, which was generously furnished by Dr. H. Raistrick (1), and tolu-p-quinone.

The fungi (5, 6, 7) used included: *Pleurotus griseus* (No. 14616R), *Poria corticola* (No. 71280), *Poria tenuis* (No. 67942), *Corticium* sp. (No. 14572R[2]), and *Polyporus biformis* (No. 71423R). The antibacterial substances produced by *Poria corticola, Polyporus biformis,* and *Corticium* sp. 14572R are different from one another and different from the other antibiotic substances included in this investigation.[3] The antibiotic material produced by *P. tenuis* is similar to that of *P. corticola.*

[1] This investigation was supported in part by grants from the Commonwealth Fund and the Lillia Babbitt Hyde Foundation.

[2] This fungus is listed in previous papers as *Corticium abeuns.* Dr. H. S. Jackson has determined the fruit body collected when the fungus was isolated to be that of *Corticium ochraceum.* It is possible, however, that the mycelium which was isolated was not that which formed the fruiting body. Until sporophores can be produced in culture, the identity of this fungus is uncertain.

[3] The terms antibacterial and antibiotic may need elucidation. Any substance which inhibits the development of bacteria may properly be called an antibacterial substance. For the purpose of this paper, an antibiotic substance is defined as a soluble organic substance produced by an organism and markedly inhibitory to the growth or activity of one or more living organisms. Oxford (4) required an antibiotic substance to produce

For the agar disc tests, the fungi were grown in petri dishes on a modified Czapek-Dox agar medium containing corn steep solids (5). The antibacterial substances were made up in 1.5 per cent water agar. Discs 5.5 mm. in diameter were cut from the fungus colonies and underlying agar or from the water agar in which the antibacterial substances were dissolved. The discs were placed on the surface of yeast-peptone agar (5) freshly seeded with the indicator organisms and the petri dishes were incubated at a suitable temperature.

For the liquid cultures, a subminimal concentration of one antibiotic preparation was added to each tube of a set in which the activity of a second was determined for *Staph. aureus* by serial dilution (3). A comparison of the maximum dilution at which the mixture evidenced inhibition with that for the one preparation alone formed the basis for judging the degree of synergism.

Experimental Results. *Disc Tests.* The phenomenon with which we are concerned is illustrated in figure 1, A. In this experiment, agar discs containing approximately 50 μg. of streptomycin per ml. and discs cut from a colony of *P. corticola* were tested on yeast-peptone agar seeded with *B. mycoides* and incubated at 30° C. The streptomycin disc (lower left in fig. 1, A) produced in inhibition zone 12 mm. in diameter spotted with resistant colonies; the disc of *P. corticola* (lower right, fig. 1, A), an inhibition zone 28 mm. in diameter. The inhibition caused by *Poria* was partial; numerous small and a few larger colonies were present in the inhibition zone, few near the center and more toward the edge forming a "bull's-eye." We believe that these colonies were not composed of a strain of *B. mycoides* resistant to the antibiotic materials from *P. corticola* but were mainly colonies the development of which was interfered with but not prevented by the antibiotic material.

When the discs were placed so that their edges were 11 mm. apart, the colonies which would be expected to appear between the two discs did not develop. Visible antibacterial action of the streptomycin, which extended 3 mm. from the edge of the disc when it acted alone, was evidenced to a distance of 11 mm. from the edge of the disc containing streptomycin when in the presence of the antibacterial materials from *P. corticola.* The discs of *P. corticola,* which partially inhibited the bacteria up to a distance of 11 mm. from the edge of the disc when alone, induced action at a distance of 16 mm. in the presence of streptomycin as shown by the elimination of resistant colonies in the vicinity of the streptomycin disc. Streptomycin, at

a measurable effect *in vitro* at a concentration of the order of 50 parts per million or less. All the substances tested in the work described in this paper are antibacterial; not all can properly be referred to as antibiotic substances either because of their origin (tolu-p-quinone) or of the concentrations at which they are active (acetic acid).

concentrations below the inhibitory level, intensified the action of the substances formed by *P. corticola*, and the antibacterial substances from the fungus had a similar, though perhaps less marked, effect upon the activity of streptomycin. The subminimal inhibitory concentrations of the antibacterial materials from *P. corticola* were effective by eliminating colonies of

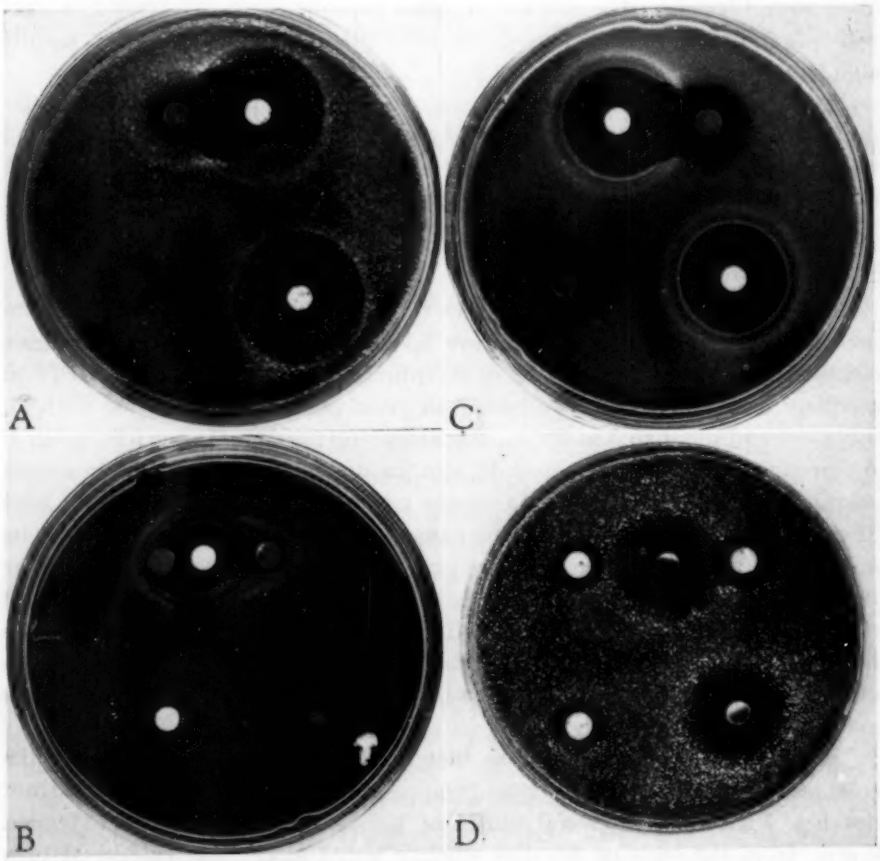

FIG. 1-. Agar discs cut from colony of *Poria corticola* and agar discs containing streptomycin tested on yeast-peptone agar against: A. *Bacillus mycoides* at 30° C; B. *Staphylococcus aureus* at 37° C; C. *Bacillus subtilis* at 30° C; and D. *Sarcina lutea* at 30° C. The fungus discs can be distinguished by the white mycelium which covers the surface of the discs. Note marked synergism between streptomycin and *Poria corticola* for *Bacillus mycoides* and *Staphylococcus aureus*, less for *Bacillus subtilis* and little or none for *Sarcina lutea*.

bacteria resistant to streptomycin and subminimal inhibitory concentrations of streptomycin acted by preventing the development of colonies which were partially inhibited by the fungus.

Results with Other Bacteria. Much the same interaction between strep-

tomycin and the antibacterial material formed by *P. corticola* was observed on *Staph. aureus* grown at 36° C (fig. 1, B); to a lesser degree on *B. subtilis* grown at 30° C (fig. 1, C) and on *Sar. lutea* grown at 30° C (fig. 1, D).

There was some relation between the occurrence of resistant colonies or partial inhibition and the intensity of the synergistic effect. For example, the inhibition produced by the discs of *P. corticola* was partial when the plates were seeded with *Staph. aureus* or *B. mycoides*. The mutually intensifying action of streptomycin and the antibacterial substances from *Poria* on these two bacteria was marked. Furthermore, the synergistic action was confined to the areas where partial inhibition of the bacteria occurred or colonies of resistant bacteria were evident when the antibacterial substances acted individually. Partial inhibition or the presence of resistant colonies was less evident when the plates were seeded with *Sar. lutea* or *B. subtilis* and the synergistic action was less obvious.

The pattern between the discs varied with the indicator bacteria and with the antibiotic substances as illustrated in figures 1, 2, and 3, A.

In the experiment illustrated in figure 2, discs containing approximately 50 μg. of streptothricin per ml. and discs from a colony of *P. corticola* were used. The plate illustrated in figure 2, A, was seeded with the stock strain of *Staph. aureus* and the edges of the discs were 11.5 mm. apart. The plate illustrated in figure 2, B, was seeded with a strain of *Staph. aureus* resistant to the antibacterial material from *Corticium* sp. 14572R. This strain was derived from the stock. The edges of the discs were 15.7 mm. apart. The synergistic pattern for both strains of *Staphylococcus* is similar. The elimination of colonies of bacteria resistant to streptothricin by subminimal inhibitory concentrations of the antibacterial material from *Poria* is evident (especially in figure 2, B). The elimination of organisms (partially affected by the antibiotic material from *Poria*) by subminimal inhibitory concentrations of streptothricin is also clear.

The pattern was influenced also by the distance between the two discs. For example, discs of agar containing streptomycin were placed on each side of a mycelial disc of *P. corticola* but at different distances (fig. 1, B). The pattern of synergistic action between the *Poria* disc and the nearer of the two discs containing streptomycin differed from that where the separation was greater. As a result, the partially inhibited colonies of *Staph. aureus* unaffected by the streptomycin, formed two strips above and below the disc from the fungus which were tipped toward the more distantly located disc containing streptomycin.

When *Staph. aureus* or *B. mycoides* were used as indicator organisms and the discs of *P. corticola* and streptomycin were sufficiently far apart, a half-moon-shaped area of nearly complete inhibition in the midst of an area of partial inhibition was observed. The horns of the half-moon were turned

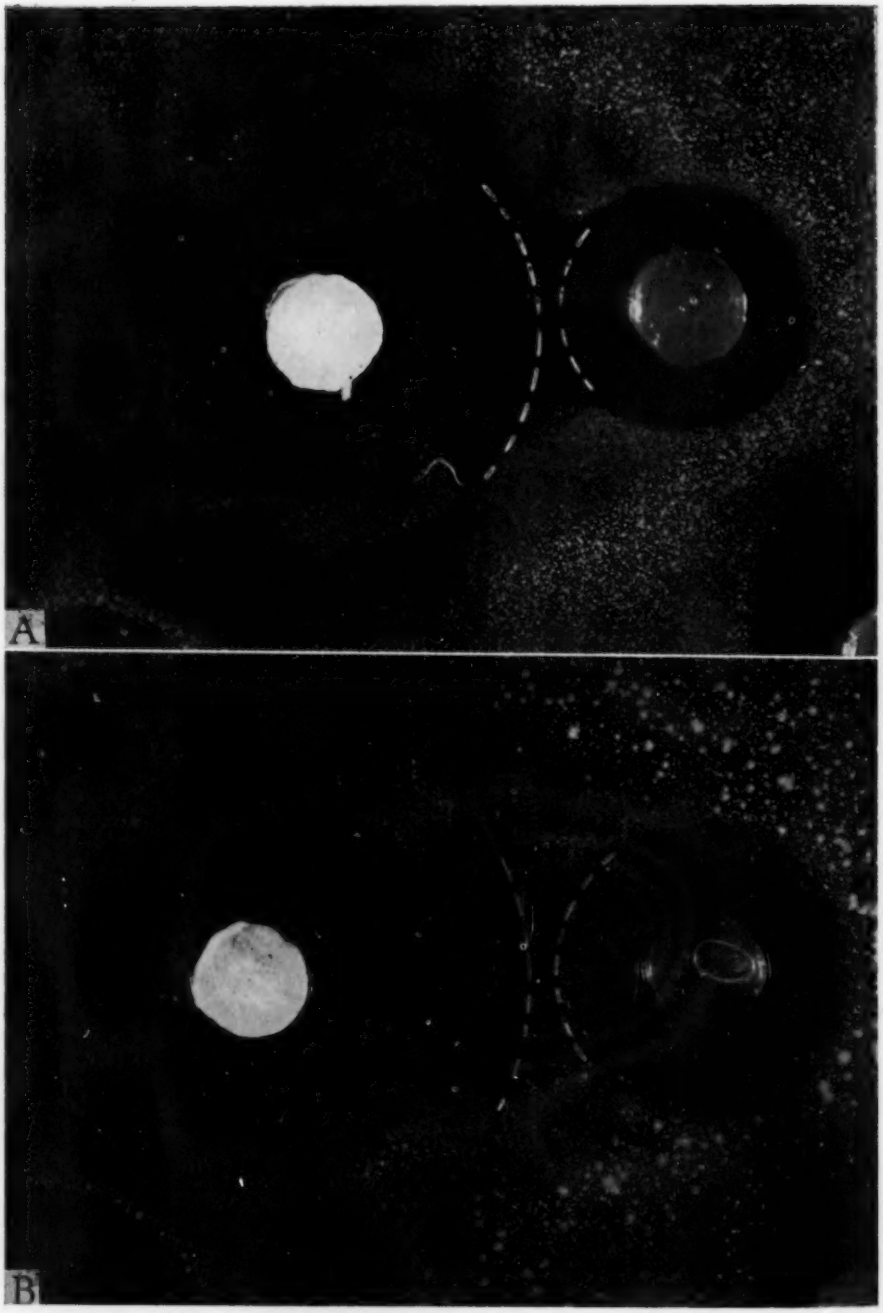

FIG. 2. A. Disc from *Poria corticola* (left) and disc containing streptothricin (right) on yeast-peptone agar seeded with stock *Staphylococcus aureus*. B. Disc from *Poria corticola* (left) and disc containing streptothricin (right) on yeast-peptone agar seeded with strain of *Staphylococcus aureus* resistant to the antibiotic material from *Corticium* sp. 14572R. The limits of action of the antibacterial material from each disc if it acted alone is given by the dotted circles.

toward the disc from the fungus colony. It appeared that the antibacterial substances from the fungus were of insufficient concentration to intensify the activity of the streptomycin in the area between the half-moon and the disc containing streptomycin. On the other hand, the concentration of streptomycin was insufficient to affect materially the antibacterial substances

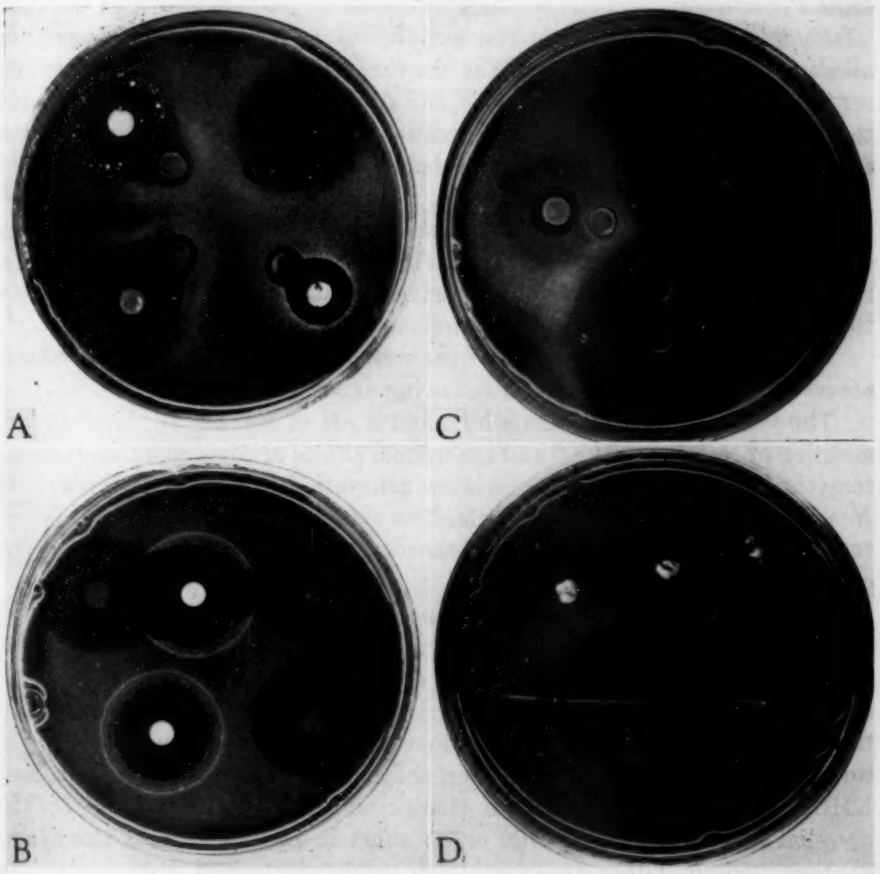

FIG. 3. A. Agar discs containing streptomycin (toward center of plate) tested against *Staphylococcus aureus* with discs from colony of (upper left) *Corticium* sp. 14572R, (upper right) *Poria corticola*, (lower right) *Pleurotus griseus*, and (lower left) *Poria tenuis*. B. Discs from colony of *Poria corticola* and agar discs containing streptomycin tested on yeast-peptone agar at pH 8.0; seeded with *Bacillus subtilis*. Compare with figure 1. C. Agar discs containing streptomycin (toward center of plate) tested against *Staphylococcus aureus* with (upper left) agar disc containing 12 per cent KH_2PO_4, (upper right) agar disc containing 12 per cent $KHCO_3$, and (lower center) agar disc containing 10 per cent acetic acid. D. Above, discs from colony of *Poria tenuis;* below, agar discs containing penicillin. Strip of agar removed from plate at initiation of experiment. Note spread in activity where antibacterial zone touches agar edge.

from the *Poria* in the area between the half-moon and the *Poria* disc. In the half-moon where inhibition was nearly complete, each of the two substances was present in suitable concentration to effect a degree of inhibition of *Staph. aureus* neither caused when acting alone. A similar result was noted for other antibiotics, for example, patulin and the antibacterial substances from *P. corticola.*

Hydrion Concentration. The activity of streptomycin is greater in alkaline than in acid solution. Was the increased antibacterial activity observed between discs of *P. corticola* and discs containing streptomycin due to a change in the hydrion concentration of the medium induced by the fungus discs? This does not seem probable, because the discs of *P. corticola* were acid, not alkaline. Furthermore, the effects varied with the indicator organism; they were marked for *Staph. aureus* and *B. mycoides* and much less so for *B. subtilis* and *Sar. lutea.* If the apparent synergesis were the result of pH changes induced by the mycelial discs, we would rather expect them to appear irrespective of the indicator organism.

Further evidence that pH changes were not responsible for the effects observed, was obtained from the following experiments.

The yeast-peptone medium which had a pH of 6.5 was adjusted by the addition of NaOH to pH 8.0 and the mutual effects of discs containing streptomycin and discs of *P. corticola* were determined with *Staph. aureus* and *B. subtilis* as the indicator bacteria. The synergistic action between streptomycin and the antibacterial substances from *P. corticola* was observed on the alkaline medium (fig. 3, B).

Discs were prepared containing 12 per cent KH_2PO_4, 12 per cent $KHCO_3$, and 10 per cent acetic acid. The effect of these discs on the activity of discs containing streptomycin was tested on yeast-peptone agar with *Staph. aureus* as the indicator organism (fig. 3, C). The KH_2PO_4 reduced the activity of streptomycin, the $KHCO_3$ increased it and the effect was greater toward the disc of $KHCO_3$. However, the alkalinity induced by 12 per cent $KHCO_3$ was far beyond any pH change which might be induced by the mycelial discs which have little or no effect in the reaction of the yeast-peptone medium. Other experiments on the interaction of discs containing $KHCO_3$ and streptomycin with *Staph. aureus* and with *Sar. lutea* as the indicator organisms led to the same conclusion.

The acetic acid was quite inhibitory. Because of the wide zone of action of the acetic acid, its influence on streptomycin in this experiment (fig. 3, C) was not determined. However, the acetic acid showed a greater effect than was anticipated at the edge of the plate. Instead of forming a circle, the zone of inhibition was extended at the plate edge. This edge effect was further investigated.

Edge Effect. In the experiment described previously, an extension of

the antibacterial action of acetic acid was noted at the edge of the petri dish. An edge effect was noted also with penicillin, the antibacterial substances from *P. tenuis,* and tolu-p-quinone. It was evident at an agar edge (fig. 3, D) as well as at the edge of a petri dish. It was affected by the depth of the medium on which the discs were tested. The edge effect was more pronounced in dishes containing 18 ml. of medium than in dishes with 36 ml. of medium. The edge effect is probably the result of an accumulation of the antibacterial substance at a boundary which interferes with or prevents free diffusion.

Interaction between Other Antibacterial Substances. The interaction between mycelial discs of several fungi, antibacterial concentrates prepared

TABLE 1. *Synergism for Staphylococcus aureus on yeast-peptone agar between agar discs of the fungi or antibacterial preparations noted.*
The occurrence of synergism is noted by the + sign.

	71280 *Poria corticola,* mycelial discs	69742 *Poria tenuis,* mycelial discs	*Corticium* sp. 14572R, mycelial discs
Corticium sp. 14572R, mycelial discs	+++	+++	No test
Corticium sp. 14572R, concentrate from culture liquid	+	+	No test
Patulin	++	++	+
Streptomycin	+++	+++	+
Streptothricin	+++	+++	No test
Pleurotus griseus, mycelial discs	0	0	+
Pleurotin	0	0	No test
Polyporus biformis, mycelial discs	0	0	+
Antibiotic substance from burdock	0	0	No test
Penicillin	0	0	No test
Tolu-p-quinone	0	0	No test
Poria corticola, mycelial discs	No test	0	+++
Poria tenuis, mycelial discs	0	No test	+

from culture liquids of some of them, and known antibiotic substances was investigated. *Staph. aureus* incubated at 36° C was used as the indicator organism. Positive action was noted for some combinations and none for others (table 1). In addition to the combinations given in table 1, positive results were obtained between tolu-p-quinone and the antibiotic substance from burdock, and between streptomycin and an extract of the leaves of *Cassia reticulata* (8). Negative results were obtained for streptomycin and mycelial discs of *Trametes serpens.*

Experiments in Broth Cultures. The synergistic action between streptomycin and culture liquids of *P. corticola* and *P. tenuis* was tested in a number of experiments in beef extract or yeast-peptone broth. An amount

of streptomycin below the minimum necessary to inhibit the growth of *Staph. aureus* was added to each tube in a set in which the activity of the culture liquid of the fungus was determined by serial dilution. The maximum dilution at which the culture liquid evidenced inhibition was compared with that found for the culture liquid assayed in the presence of a subminimal concentration of streptomycin. Conversely, a subminimal inhibitory concentration of the culture liquid was used in a serial dilution test of streptomycin.

Experiments were carried out in beef extract and in yeast-peptone broth. Positive results were obtained. In one experiment, one-quarter of the minimal inhibitory concentration of streptomycin increased the activity of the culture liquid of *P. corticola* two times, and one-half the minimal inhibitory concentration increased it 16 times. In other experiments, the effect was less or none. Similarly, one-fourth the minimal inhibitory concentration of the culture fluid of *P. corticola* doubled the activity of streptomycin in one experiment.

Positive results were more consistently obtained in liquid cultures when subminimal inhibitory concentrations of streptomycin were used in a serial dilution test with the culture fluid from *P. corticola* than when the reverse combination was made. The reasons for this are not clear. However, variations in pH and the concentration of the antibiotic substances (that of the one used in subminimal amount in particular) were found to be important factors in determining synergism in liquid cultures.

Discussion. The synergistic effects reported above may be ascribed in part to the occurrence in a stock culture of individuals resistant to a particular antibiotic substance but susceptible to a second and different antibacterial material. The antibiotic material from *P. corticola* (at a concentration which evidenced no obvious effect on the mass of bacteria in an agar plate) was observed to eliminate colonies resistant to streptomycin. We would expect, therefore, to find that a strain of *Staph. aureus*, for example, resistant to streptomycin would be inhibited by a greater dilution of the culture liquid of *P. corticola* than the stock from which the resistant strain was derived.

The phenomenon of partial inhibition is important also in determining synergism. For example, the antibacterial material from *P. corticola* when sufficiently dilute does not completely inhibit the development of *Staph. aureus* but interferes with it. At such a dilution, the liquid is bacteriostatic but only partially so, with the result that many small colonies are present on an agar plate in the zone of inhibition surrounding a disc of mycelium of the fungus. In a serial dilution series, the tubes in which the greater concentration of antibiotic material occurs and complete inhibition is found are followed by those in which there is partial inhibition as evidenced either

by a precipitation of the bacteria or by less growth or both. These organisms which are affected to some extent by the antibacterial material from *P. corticola* are rendered more susceptible to the action of subminimal inhibitory concentrations of streptomycin.

If our interpretation of the experiments described here is correct, synergistic action of antibiotic substances might occur either because of the elimination of resistant organisms or because organisms already weakened to some degree by one antibiotic substance become more susceptible to a second. In any event, it would appear desirable to pursue investigations of this type further and to include in the evaluation of antibiotic substances those which are only partially effective in inhibiting the growth of particular bacteria.

SUMMARY

One antibiotic substance was found to evidence synergistic action on another depending upon the substances concerned and the indicator bacteria used. The phenomenon was observed when agar discs were placed near one another on an agar plate seeded with the indicator bacteria. The synergistic action was noted in liquid culture also. It is associated with the elimination of organisms resistant to one antibiotic substance but not to another or with an intensification by one antibiotic substance of a partial inhibition induced by another.

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BULLETIN OF THE TORREY BOTANICAL CLUB
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TAXONOMIC AND CYTOLOGICAL NOTES ON THE ANNUAL SPECIES OF HELIANTHUS

CHARLES B. HEISER, JR.

Helianthus, a genus of the Compositae, comprises approximately one hundred species. Although a few species are found in South America, its distribution is primarily North American. The majority of species in the genus are perennials. Gray (1884) recognized only six species and two varieties of annual sunflowers. Cockerell (1915), who studied the annual sunflowers for a number of years, recognized "at the most nine species which can probably be reduced to five." E. Watson (1929), in his contributions to a monograph of the genus, included ten annual species in the genus, two of which were described as new. Blake (1931) described *H. anomalus*, which subsequently was found to be an annual. Another new species is described in the present paper.

I have grown several species of annual sunflowers for a number of years, examined the material in several herbaria, and made field observations in many regions. On the basis of these studies I would be inclined to recognize nine species. These are as follows: *H. annuus* L., *H. petiolaris* Nutt., *H. debilis* Nutt., *H. argophyllus* Torr. & Gray, *H. Bolanderi* A. Gray, *H. agrestis* Pollard, *H. praetermissus* E. E. Wats., *H. anomalus* Blake, and *H. Jaegeri*, described below.

My interpretation differs from Watson's (1929) in that I would consider *H. canus* (Britton) Wooton & Standley as merely a variety of *H. petiolaris* (*H. Petiolaris* var. *canescens* A. Gray) and *H. cucumerifolius* Torr. & Gray a variety of *H. debilis* (*H. debilis* var. *cucumerifolius* A. Gray). Watson's *H. vestitus* is probably merely a form of *H. debilis* with a hirsute stem and should be included within that species.

Watson's *H. praetermissus* is known only from the type collection of the Sitgreaves Expedition at Rio Laguna (Valencia County), New Mexico. The specimen described by Watson (p. 335, Pl. XLVII) probably represents a depauperate individual, for I have examined an isotype from the Gray Herbarium which has much larger leaves (12 cm. in length; 2–3 cm. in width) and a branched rather than a simple inflorescence.

During my investigation of the annual sunflowers of California in 1946, Dr. Lyman Benson sent me an undetermined *Helianthus* which he thought might be of interest. Subsequent study showed that this specimen represented a new species in the genus and accordingly is described below.

Helianthus Jaegeri Heiser, sp. nov. Herba annua, caulibus superne ramosis, sparse hispidis, foliis alternatis petiolatis lamina lanceolata basi cuneata serrulata ad 15 cm. longa 10 cm. lata hispida pilis brevibus, involucro 2-seriato, bracteis ovato-lanceolatis hispidulis 3–4 mm. latis apice attenuatis patulo-squarrosis disco 1.5–2.0 cm. diam., paleis receptaculi 3-cuspidatis arista media longa lanceolataque, ad apicem purpurea hispidaque, radiis flavibus ca. 10–15 ca. 2 cm. longis 6–7 mm. latis; corollis disci 5–6 mm. longis, angustis basi leviter dilato-bulbosis lobis purpureis, achaeniis ca. 5 mm. longis 2 mm. latis leviter pilosis, squamis pappi 2 angusto-lanceolatis ca. 3 mm. longis.

TYPE: California, San Bernardino County: swampy areas near Soda on border of Soda Dry Lake. Soil: sodium sulfate. Sept. 25, 1946. *Edmund C. Jaeger s. n.* (Pomona College, no. 270144).

The root is not included on the type specimen, and at first I thought that the plant might be a perennial. However, it was quite unlike any of the perennials of that region, and I wrote Dr. Benson if it would be possible to secure information regarding the habit of the plant. Mr. Jaeger then revisited the region and found that all the old roots were dead and that plants were coming up from seed. The new species is named for Mr. Jaeger, who has long been a student of desert life of California.

The new sunflower presents no features unknown in other species of the genus, but the combination of features is quite unlike that of any other annual. It is perhaps worth while to point out the characters by which it is most readily distinguished from the annual sunflowers of southern California, although none of these are known to occur in the vicinity of the new species. From *H. annuus* it is distinguished at once by the smaller heads, the narrower leaves and involucral bracts, and from *H. petiolaris* by lacking the dense white pubescence of the central pales of the chaff.

Seeds from the type specimen were planted in the greenhouse at Davis in December of 1946 with a number of other annual species. However, the plants of *H. Jaegeri* had not produced buds by May, at which date (the plants of) *H. annuus*, *H. petiolaris*, and *H. Bolanderi* were in flower. The plants of *H. Jaegerii* were then transplanted to the field and finally bloomed in late August. I am greatly indebted to Mr. Walter Russell for securing buds of these plants for cytological analysis.

The basic chromosome number of the genus *Helianthus* is seventeen (Geisler 1931; Darlington & Janaki Ammal 1945), and all the species thus far investigated possess this number with the exception of three hexaploid perennial species. The counts known for the annuals, including those presented in the present paper, are given in table 1.

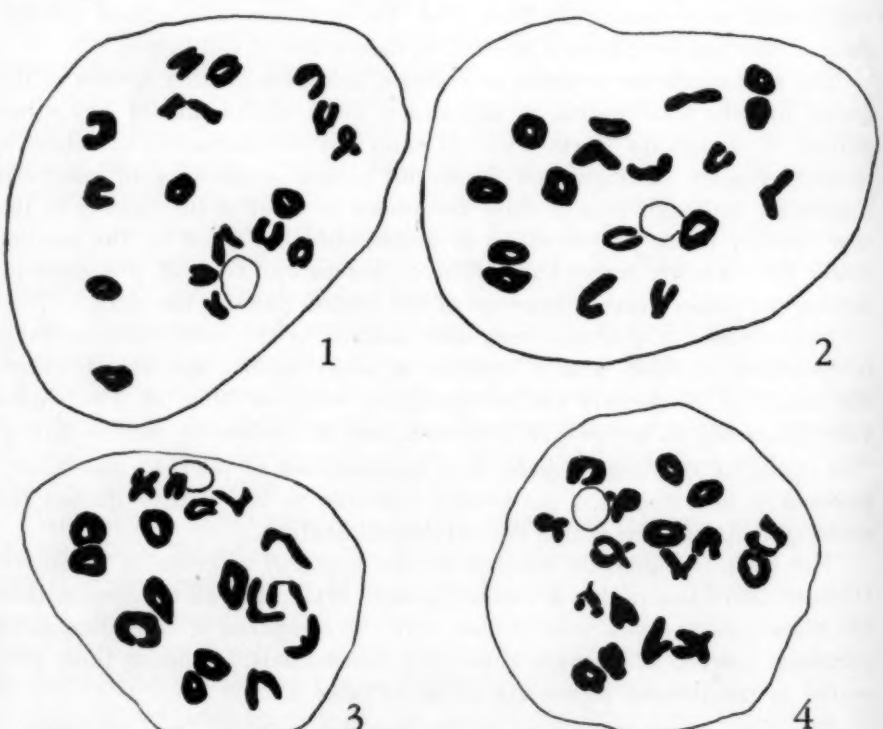
The three counts given here for the first time were all from microsporocytes smeared in aceto-carmine. The buds for the smears of *H. Jaegeri* were taken from plants grown from seed of the type specimen; buds of *H. petiolaris* var. *canescens* were obtained from plants grown from seed col-

TABLE 1. *Chromosome numbers in the annual species of Helianthus*

Species	Number		Authority*
	n	*2n*	
H. annuus L.		34	Tahara 1915
	17		Kostoff 1939
H. argophyllus T. & G.	17		Present paper
H. Bolanderi A. Gray	17		Heiser 1947a
H. debilis var. *cucumerifolius* (T. & G.) A. Gray		34	Kihara, Yamamoto, and Hosono 1931
	17		Wagner 1932
H. Jaegeri Heiser	17		Present paper
H. petiolaris Nutt.	17		Heiser 1947b
H. petiolaris var. *canescens* A. Gray	17		Present paper

* The bibliography includes the earliest reference which I have been able to locate.

lected by Dr. Frank Gould near Tucson, Arizona; and buds of *H. argophyllus* were from plants grown from seed taken from a herbarium specimen at the University of California (*Cory 51242* collected in San Patricio County, Texas). The specimens upon which my counts are based have been deposited in the herbarium of Indiana University. All three species



FIGS. 1–4. Camera lucida drawings of chromosomes of *Helianthus* and *Tithonia*. Approximately × 1250. FIG. 1. *H. argophyllus*. FIG. 2. *H. Jaegeri*. FIG. 3. *H. petiolaris* var. *canescens*. FIG. 4. *T. rotundifolia*.

have the haploid count of seventeen (figs. 1–3). Behavior of the chromosomes at meiosis in *H. argophyllus* and *H. petiolaris* var. *canescens* appeared normal. In the material of *H. Jaegerii*, in eight of the fifty cells studied, chains of four chromosomes and fifteen pairs were observed instead of the normal seventeen pairs. However, the presence of chains resulted in little or no sterility. Pollen slides showed that over 90 per cent of the grains were stainable.

For the genera closely related to *Helianthus* (*Viguiera, Tithonia*, etc., see Blake 1918) no chromosome counts have been reported. I have secured a count of seventeen pairs (fig. 4) for *Tithonia rotundifolia* (Mill.) Blake; (*Tithonia speciosa* Hook. of horticulturists) from cultivated material. The number seventeen has not been reported for any other genera of the tribe Heliantheae of the Compositae so far as I am aware.

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POLLEN GRAIN CHARACTERS OF CERTAIN CACTACEAE

EDWIN B. KURTZ, JR.

A study of the pollen grains of cacti native to Arizona shows that the grains are of two forms. Each basic form can be further subdivided by size, sculpturing of exine, and number and position of germ pores, so that the genera, subgenera, and some species may be distinguished by their pollen grains. For this study pollen samples were obtained from plants growing locally, and from herbarium specimens. I am greatly indebted to Dr. F. W. Gould for the use of the University of Arizona Herbarium, Tucson, Arizona, and to R. H. Peebles for the use of the excellent collection of cactus material in the Herbarium at Sacaton, Arizona. I wish also to thank Dr. W. S. Phillips for his kind suggestions and interest in all phases of this study. All pollen was mounted in glycerin jelly and stained either with methyl-green which made the ridge schemes especially clear, or with aqueous fuchsin which brought out the sculpturing of the exine. This method of mounting expanded the grains completely and examination and measurements were made from the expanded grains in polar view. The pollen characters observed are presented in the following keys and discussions.

Grain spheroidal; all grains tricolpate or a mixture of tricolpate and mono-, di-, tetra-, and nonacolpate (*Echinocereus pentalophus* may be dodecacolpate); exine pitted ..... *Cereus, Echinocactus, Mammillaria, Echinocereus.*

Grain dodecacolpate; cube and dodecahedron[1] or a variation of this usually with more than 18 faces, or tending to be a spherical and regular cube and dodecahedron with outline of faces indistinct (*Opuntia*).

Grain spherical, cube and dodecahedron; tetragons and hexagons not distinct; ridges not raised, usually wide; exine pitted; pores circular. *Opuntia* subg. *Cylindropuntia.*

Grain a perfect cube and dodecahedron or a variation of it; ridges raised; tetragons and hexagons distinct; exine reticulate. *Opuntia* subg. *Platyopuntia.*

CEREUS, ECHINOCACTUS, MAMMILLARIA, ECHINOCEREUS

Grain tricolpate; spheroidal; 41–82 μ in diameter; exine finely pitted and in some species, especially *Cereus Schottii*, minutely spiney (spines up to 1.5 μ high). In pollen samples of each species most grains are tricolpate, but many mono-, di-, tetra-, penta-, hexa-, and nonacolpate grains also occur. The furrows of tricolpate grains are long, usually narrow, and approach within 5–10 μ of the poles. As the number of furrows increases the

[1] A cube and dodecahedron is a solid with six squares and twelve hexagons.

furrows become progressively shorter (fig. 3). Of special interest are the grains of *Echinocereus pentalophus* which may be the typical tricolpate type, but many grains are large (67 μ) and dodecacolpate; that is, with twelve short, equally spaced furrows so arranged that their axes converge toward eight triradiate centers. These grains rather closely resemble pollen of *Opuntia leptocaulis* or similar *Opuntia* pollen, and may indicate a possible relationship. Furrow margins of *Cereus, Echinocactus, Mammillaria, Echinocereus* pollen may be distinct or fringed with overlapping exine. Germ pores are not visible. Expansion of grains is accomplished by the evagination of the furrows from the dry state in which the furrows are slightly to deeply invaginated. Germinal furrows may be flecked, granular, or smooth, but this is usually not constant for a species.

Identification of genera and species on the basis of their pollen seems impracticable, although if the genus is previously known, pollen size may be useful in ascertaining the species, as in distinguishing long-spined forms of *Echinocereus coccineus* from *Echinocereus polyacanthus*. Pollen measurements in this group are as follows:

Echinocactus (fig. 3)

48–50 μ—*E. Lecontei* Engelm.
49–51 μ—*E. Wislizenii* Engelm.
50 μ—*E. Covillei* (Britt. & Rose) Berger
50 μ—*E. longihamatus* Galeotti
55 μ—*E. acanthodes* Lemaire
58–59 μ—*E. intertextus* Engelm.
62 μ—*E. Sileri* Engelm.
62–65 μ—*E. polyancistrus* Engelm. & Bigel.
57–65 μ—*E. Whipplei* Engelm. & Bigel.
67 μ—*E. erectocentrus* Coulter
73 μ—*E. Johnsonii* Parry
71–79 μ—*E. horizonthalonius* Lemaire

Mammillaria

43–50 μ—*M. vivipara* Engelm.
52–54 μ—*M. deserti* Engelm.
53–54 μ—*M. microcarpa* Engelm.
58–59 μ—*M. Alversonii* (Coulter) Zeissold
60–63 μ—*M. arizonica* Engelm.

Cereus

50–55 μ, mostly 50 μ—*C. giganteus* Engelm.
58–61 μ—*C. Schottii* Engelm.
65–69 μ—*C. Thurberi* Engelm.
68–82 μ—*C. Greggii* Engelm.

Echinocereus

41–55 μ—*E. mojavensis* (Engelm. & Bigel.) Rumpler
45–60 μ—*E. Ledingii* Peebles
50–55 μ—*E. polyacanthus* Engelm.
50–67 μ, mostly 50–60 μ—*E. pentalophus* (D. C.) Rumpler
52–54 μ—*E. Engelmannii* (Parry) Rumpler
57–59 μ—*E. coccineus* Engelm.
61–62 μ—*E. Bonkerae* Thornber & Bonker
62 μ—*E. rectispinus* Peebles
63–64 μ—*E. Fendleri* (Engelm.) Rumpler
64–65 μ—*E. rigidissimus* (Engelm.) Rose
64–70 μ—*E. rectispinus* var. *robustus* Peebles
65–69 μ—*E. Boyce-Thomsonii* Orcutt

OPUNTIA

Grain dodecacolpate; cube and dodecahedron; 65–130 μ in diameter; exine thick, pitted or reticulate; exine thrown into ridges or ridges not

present; furrows coincide with germ pores; pores flat to convex, smooth, granular or flecked, circular to linear. Usually *Opuntia* grains are cube and dodecahedrons, with a germinal furrow (germ pore) in the center of each of twelve more or less regular hexagons, and six thick, highly reticulate or pitted tetragons (fig. 1). Assuming any two opposite tetragons as poles, three equal polar axes are formed, and the grain appears the same when viewed parallel to each of the three axes. Most samples of pollen of *Opuntia* contain grains of the cube and dodecahedron type, and from few to many grains have more numerous faces (about 30 in *O. gilvescens*), which may be tetragons, triangles, pentagons, hexagons, or in *O. flavescens* regular grains having eight heptagons, six tetragons, and eight hexagons occur (fig. 2). Grains with more than eighteen faces are usually polycolpate with more than the regular number of twelve furrows. The exine in most species is thick except over the hexagons and pores. The ridges are high to low, narrow to wide, depending upon the species. The exine of the tetragons may be pitted or from finely to coarsely reticulate, and the ridges sculptured similarly. The degree of reticulation or pitting is the most consistent character of each species (figs. 4–9). The sculpturing usually becomes granular in the hexagons up to or over the germ pores. If the germ pores are convex in the expanded form they often break through the exine, causing an irregular pore margin. The pores and hexagons evidently act as harmomegathy for the expansion of the grain because in the dry form the hexagons appear as if pushed in, the whole grain assuming a very wrinkled or crumpled form. Upon expansion of the grain the pores may become very prominently protruding or convex, which is especially distinct in *O. fragilis* (fig. 9). It is interesting to note that all grains that possess pitted exine are from plants that belong to the subgenus *Cylindropuntia* or "chollas," whereas all grains that have reticulate exine are from plants of the subgenus *Platyopuntia* or "prickly pears." Comparisons of species in these two groups are as follows.

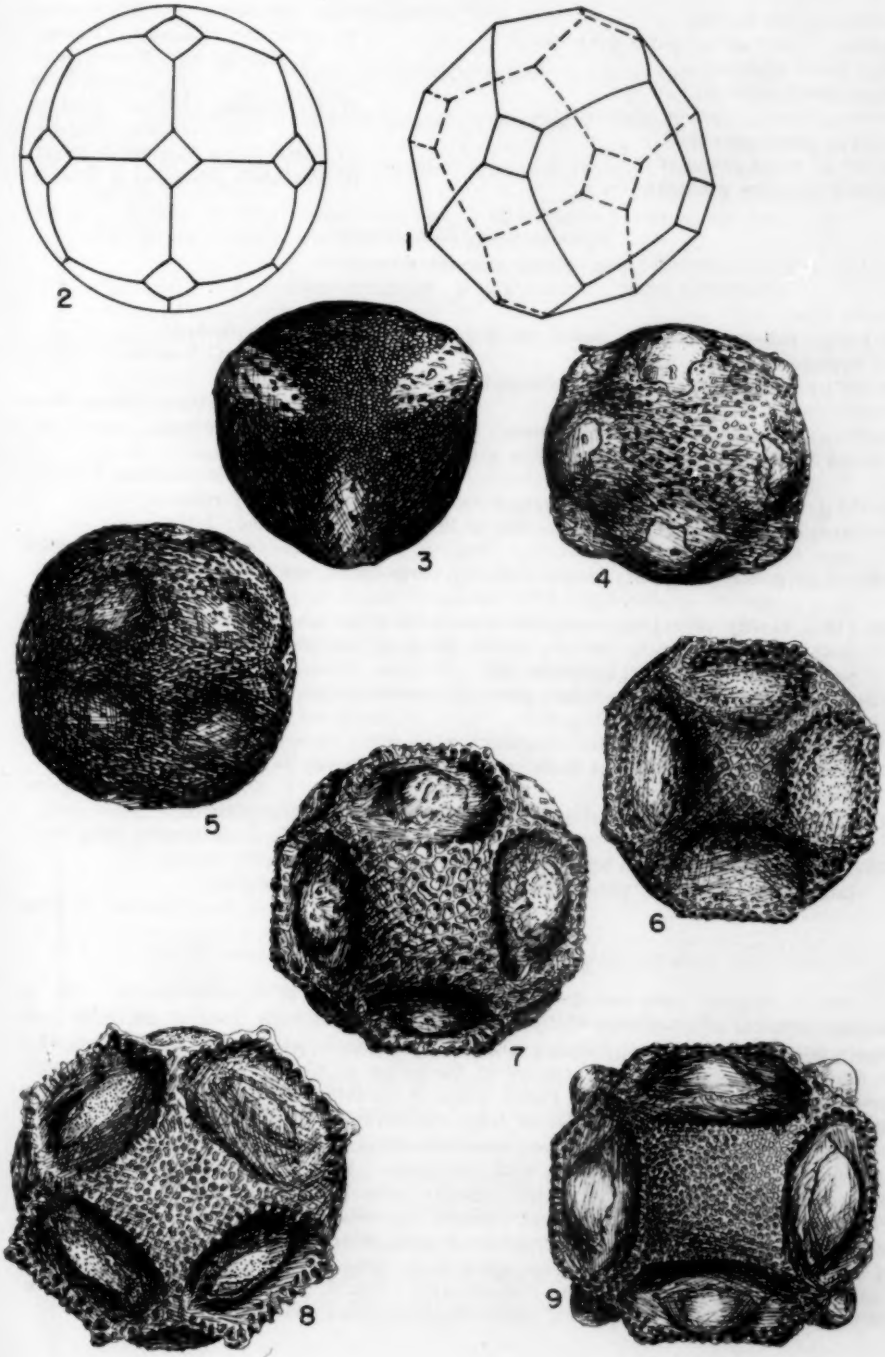
Opuntia subg. *Cylindropuntia*

A. Germ-pores convex (fig. 4)

65–68 μ; pores flecked.	*Opuntia leptocaulis* DC.
73–90 μ, mostly 78–82 μ; pores flecked, flat or mostly convex.	*O. fulgida* Engelm.
76–86 μ; pores flecked.	*O. acanthocarpa* var. *ramosa* Peebles
82–90 μ; pores flecked.	*O. Whipplei* Engelm. & Bigel.
80–120 μ; mostly 98 μ; many irregular.	*O. Bigelovii* Engelm.
93–94 μ; pores flat or convex, granular.	*O. versicolor* Engelm.
98–100 μ; pores granular, flat or convex.	*O. echinocarpa* Engelm. & Bigel.
107 μ; pores flecked, margins irregular.	*O. acanthocarpa* Engelm. & Bigel.

AA. Germ-pores flat, not convex (fig. 5)

73–90 μ, mostly 78–82 μ; pores flecked, flat or mostly convex.	*O. fulgida* Engelm.
73–100 μ, mostly 73–81 μ; pores flecked.	*O. tetracantha* Toumey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78–82 μ; pores flecked. *O. fulgida* var. *mamillata* (Schott) Coulter
86–94 μ, mostly 90 μ; pores granular. *O. spinosior* (Engelm.) Toumey
90 μ; pores granular. *O. Stanlyi* var. *Kunzei* Rose
90 μ; pores granular. *O. Kunzei* Rose
90–93 μ; pores pitted or granular. *O. Wrightiana* (Baxter) Peebles
93–94 μ; pores granular. *O. versicolor* Engelm.
98–100 μ; pores granular. *O. echinocarpa* Engelm. & Bigel.
100–106 μ; pores granular. *O. Thornberi* Thornber & Bonker

Opuntia subg. *Platyopuntia*

B. Exine coarsely reticulate

(figs. 6, 7)

94–100 μ; ridges prominent; pores not distinct, convex, may be flecked; tetragons 40–45 μ wide. *O. basilaris* Engelm. & Bigel.
96–100 μ; many irregular; ridges distinct; pores circular, granular. *O. Santa-Rita* (Griffiths & Hare) Rose
98–106 μ; coarsely to medium reticulate; usually regular; ridges distinct, not high; pores linear, reticulate or granular, flat or convex. *O. macrocentra* Engelm.
97–122 μ, mostly 105–110 μ; many irregular; exine finely to coarsely reticulate; ridges distinct; pores circular to linear, convex, flecked; tetragons 48–50 μ wide. *O. Loomisii* Peebles
106–114 μ; mostly irregular; ridges distinct; pores linear, convex, flecked. *O. tenuispina* Engelm.
106–119 μ, mostly 109–114 μ; irregular, some with ridge scheme of heptagons; ridges distinct, narrow; exine finely to coarsely reticulate; pores circular to linear, granular, flat. *O. flavescens* Peebles
110–114 μ; mostly irregular; ridges distinct; pores circular, distinct, convex, granular; tetragons 20 μ wide. *O. laevis* var. *canada* (Griffiths) Peebles
106–130 μ, mostly 114 μ; mostly irregular; exine finely to coarsely reticulate; ridges distinct; pores indistinct, circular to linear, flat to convex, granular. *O. phaeacantha* Engelm.
115–125 μ; mostly irregular; ridges distinct; pores circular, slightly convex, granular. *O. Engelmannii* Salm-Dyck
130 μ; mostly irregular with up to 30 faces; exine finely to coarsely reticulate; ridges distinct; pores indistinct, slightly convex, granular. *O. gilvescens* Griffiths

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Explanation of figures 1–9

FIG. 1. Regular cube and dodecahedron characteristic of *Opuntia pollen*. FIG. 2. Regular atypical ridge scheme of *Opuntia flavescens*, polar view, four of the eight heptagons are visible. FIG. 3. Pollen grain of *Echinocactus acanthodes*, polar view, 52 μ in diameter, exine finely pitted, typical of the pollen of *Cereus, Echinocactus, Mammillaria,* and *Echinocereus.* FIG. 4. Pollen grain of *Opuntia acanthocarpa*, 107 μ in diameter, exine pitted, typical of pollen of subg. *Cylindropuntia* with convex pores. FIG. 5. Pollen grain of *Opuntia fulgida* var. *mamillata*, 80 μ in diameter, exine pitted, typical of pollen of subg. *Cylindropuntia* with flat pores. FIG. 6. Pollen grain of *Opuntia macrocentra*, 98 μ in diameter, exine coarsely reticulate, typical of pollen of subg. *Platyopuntia.* FIG. 7. Pollen grain of *Opuntia basilaris*, 97 μ in diameter, exine coarsely reticulate, pores convex, typical of pollen of subg. *Platyopuntia.* FIG. 8. Pollen grain of *Opuntia ursina*, 100 μ in diameter, exine finely reticulate, pores slightly convex, typical of the pollen of the subgenus *Platyopuntia.* FIG. 9. Pollen grain of *Opuntia fragilis*, 90 μ in diameter, exine finely reticulate, pores very convex.

BB. Exine finely reticulate
(figs. 8, 9)

89–98 μ, mostly 90 μ; ridges distinct; tetragons 32–38 μ wide; pores linear, may be very convex. *O. fragilis* (Nutt.) Haworth.

90–114 μ; some irregular; ridges distinct; pores linear, convex, granular. *O. rhodantha* Schuman

91–113 μ, mostly 98–101 μ; ridges distinct; tetragons 41–48 μ; pores linear, convex, granular. *O. hystricina* Engelm. & Bigel.

81–98 μ, mostly 95–98 μ; some irregular; ridges distinct; tetragons 38–40 μ; pores distinct, circular, convex, granular. *O. polyacantha* var. *trichophora* (Engelm. & Bigel.) Coulter

97–110 μ, mostly 108 μ; many irregular; ridges distinct; pores indistinct, convex, granular, circular. *O. aurea* Baxter

98–102 μ; ridges distinct; tetragons 40 μ; pores linear, convex, flecked. *O. ursina* Weber

98–106 μ, mostly 98–101 μ; some irregular; ridges narrow, distinct; pores linear, convex, granular. *O. erinacea* Engelm.

98–108 μ; exine thick; ridges distinct; pores linear, about 65 μ long, slightly convex, granular. *O. hystricina* var. *rhodantha* Schuman

97–122 μ, mostly 105–110 μ; some irregular; tetragons 48–50 μ wide; exine finely to coarsely reticulate; pores circular to linear, convex, flecked. *O. Loomisii* Peebles

106–122 μ, mostly 109–114 μ; ridges distinct; tetragons 46 μ wide; pores distinct, circular, convex, flecked. *O. polyacantha* Haworth.

106–119 μ, mostly 109–114 μ; mostly irregular with ridge scheme of heptagons; ridges distinct, narrow; exine finely to coarsely reticulate; pores circular to linear, flat, granular. *O. flavescens* Peebles

111–117 μ, mostly 114 μ; mostly irregular; ridges high, 11 μ wide; tetragons 40 μ wide; pores granular or reticulate, circular. *O. tortispina* Engelm. & Bigel.

106–130 μ, mostly 114 μ; mostly irregular; exine finely to coarsely reticulate; ridges distinct; pores indistinct, circular to linear, flat to convex, granular. *O. phaeacantha* Engelm.

130 μ; mostly irregular with up to 30 faces; exine finely to coarsely reticulate; ridges distinct; pores indistinct, slightly convex, granular. *O. gilvescens* Griffiths

SUMMARY

1. A study was made of the pollen of 75 species and varieties of the Cactaceae, mostly native to Arizona.

2. The pollen of species of *Cereus, Echinocereus, Echinocactus,* and *Mammillaria* are usually tricolpate with a finely pitted exine. The diameter range of pollen of these genera is from 41 to 82 μ.

3. Species of *Opuntia* exhibit regular and irregular pollen. Regular grains are cube and dodecahedrons with twelve germ pores (germinal furrows), and the exine is either pitted (subg. *Cylindropuntia*), or from finely to coarsely reticulate (subg. *Platyopuntia*). Irregular grains have more than eighteen faces, and usually a correspondingly increased number of germ pores. Pollen grains of *Opuntia flavescens* are either typical cube and dodecahedrons or regular atypical grains with eight heptagons, six tetra-

gons, and eight hexagons. The diameter range of *Opuntia* pollen is from 65 to 130 μ.

4. Pollen of *Echinocereus pentalophus* is either tricolpate, or large and dodecacolpate, this form closely resembling the smaller pollens of *Opuntia*.

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BULLETIN OF THE TORREY BOTANICAL CLUB
VOL. 75, No. 5, pp. 523–580 SEPTEMBER, 1948

PLANT EXPLORATIONS IN GUIANA IN 1944, CHIEFLY TO THE TAFELBERG AND THE KAIETEUR PLATEAU—V

BASSETT MAGUIRE AND COLLABORATORS

HUMIRIACEAE[95]

Page references are given to R. C. Bakhuizen v./d. Brink fil., Humiriaceae, Flora of Suriname **3**: 412–421. 1941.

HUMIRIA BALSAMIFERA (Aubl.) St. Hil. (414). SURINAM: tree, vicinity Arawak village of Mata, *24957*. Guiana, Venezuela, Rio Negro. Throughout the country.

HUMIRIA CRASSIFOLIA Mart. BRITISH GUIANA: occasional, 6 m. tree, 12 cm. diam., leaves rigid, coriaceous, young fruits oval, green, seed bony, pale brown, from bush island, Kaieteur Savanna *23233*. New to British Guiana; described from the Serra de Arara Coara, Japura River, near the Peru frontier. The specimen quite agrees with Martius's excellent figure (Nova genera et species **2**: pl. 198. 1826. I have seen no other record; the species is not mentioned by Ducke in his survey of the Amazonian species in Arch. Inst. Biol. Veg. Rio de Janeiro **4**: 25. 1938.

HUMIRIA FLORIBUNDA Mart. (416). SURINAM: shrub to 4 m., much branched, rounded, flowers white, savanna vicinity of Savanna I, Tafelberg, *24223;* frequent, shrub or bushy small tree to 8 m., 10 cm. diam., flowers white, extensive rock and pigmy bush openings, Savanna VIII, Tafelberg, *24443;* frequent, shrub to much branched rounded tree of 7 m. height, Savanna II, *24707;* common, shrub or rounded much branched tree to 10 m. high, 25 cm. diam., Savanna VII, Tafelberg, *24789*. Guiana, Brazil.

HUMIRIA FLORIBUNDA Mart. var. GUIANENSIS (Benth.) Urb. BRITISH GUIANA: frequent, bushy-crowned tree 4–6 m. high, 4–8 cm. diam., flowers greenish-white from bush island, Kaieteur Savanna, *23295;* occasional, shrubby, procumbent, 1 m. high clump, 2–3 m. diam., flowers white, buds light green, Kaieteur Savanna, *23450*. SURINAM: shrub to 3 m. high, flowers greenish-white, grass savanna, Zanderij II, *23654; 23696*. Guiana. Rio Branco. Throughout the country, more common than the preceding form.

SACOGLOTTIS GUIANENSIS Benth. (418). SURINAM: frequent, tree 15 m. high, 20 cm. diam., flowers greenish, fragrant, wallaba forest, km. 19, line between Camps No. 5 and 4, Coppenam River Headwaters, *24836;* frequent, tree 20 m. high, 30 cm. diam., flowers greenish, fragrant, high mixed wallaba forest, base talus, Tafelberg, *24844*. Guiana, Brazil. The specimens probably belong to the var. *dolichocarpa* Ducke, but are without fruits.

MALPIGHIACEAE[96]

Page references are given to: A. J. G. H. Kostermans, Malpighiaceae, Flora of Suriname **2**: 146–243. 1936.

[95] By G J. H. Amshoff.
[96] G. J. H. Amshoff.

HIRAEA FAGIFOLIA (DC.) Juss. var. BLANCHETIANA (Moric.) Ndz. (168). SURINAM: infrequent, liana to 30 m., flowers pink-lavender, Charlesburg Rift, open shrub land, *22777*. Northern South America to Guatemala. Probably throughout the country; common in the Pará district.

HIRAEA CHRYSOPHYLLA Juss. (169). SURINAM: frequent, vine along river, flowers yellow, low bush bordered by *Montrichardia arborescens*, lower Saramacca River, vicinity Tawa Creek, *23744;* frequent vine, flowers yellow, bush to rear of village of Jacob kondre, Saramacca River, *23864;* frequent, vine, flowers yellow, stamens white, riverbanks Toekoemoetoe Creek, *24065*. Northern Brazil, Guiana. Common throughout the country.

TETRAPTERIS SQUARROSA Griseb. BRITISH GUIANA: rare, shrub 1.6 m. high, strict growth, paired glands green leaves chartaceous, from river fringe, Kaieteur Plateau, *23248;* occasional, rope from crown of small tree, petals yellow, clawed, anthers orange, paired glands green, along river, Kaieteur plateau, *23302*. SURINAM: frequent, scandent shrub, flowers yellow, rocks, Grasifalls, Saramacca River, *24946*. Northern South America as far as Peru. Throughout Surinam.

TETRAPTERIS FIMBRIPETALA Juss. (177). SURINAM: infrequent, shrub to 1 m., savanna, Zanderij I, *23716;* infrequent, vine, opening in *Clusia* bush, along escarpment, Tafelberg, *24630*. Guiana. Probably throughout Surinam but apparently not common.

TETRAPTERIS ACUTIFOLIA Cav. (179). SURINAM: liana, above Posoegronoe, Saramacca River, *24038*. Brazil to Guiana; in Surinam known but from few collections.

HETEROPTERIS MACROSTACHYA Juss. (192). SURINAM: liana, leaves silvery-tan beneath, flowers yellow, above Posoegronoe, Saramacca River, *24036;* liana, leaves deep green above, silvery-buff beneath, veins dark brown, ovules 1, pericarp scantily scurfy within, fruits scurfy brown, 5–10 km. above Boschland, Saramacca River, *24041; 24048*. From Costa Rica to Peru, West Indies. Throughout the country.

HETEROPTERIS MULTIFLORA (DC.) Hochr. BRITISH GUIANA: Kamuni Creek, Groete Creek, Essequibo River, *F3607*. Northern South America, Jamaica.

HETEROPTERIS NERVOSA Juss. (193). SURINAM: frequent, vine, flowers yellow, along Saramacca River, vicinity Brokolonka, *23788*. Northern South America from Panama to Peru; West Indies. Common throughout the country.

BANISTERIOPSIS LUCIDA (Rich.) Small. BRITISH GUIANA: frequent, rope with drooping shoots, fruit a samara, seed yellow-green, wing pink, along Potaro River above Kaieteur Fall, *23354*. Brazil, Guiana, West Indies.

BANISTERIOPSIS LEPTOCARPA (Benth.) R. O. Williams. BRITISH GUIANA: 4 cm. diam. black, soft, pliable rope used for cordage, from crown of a *Tapitira* in *Manicaria* swamp forest, leaves thinly leathery, glabrous, flowers in large terminal inflorescences on side shoots, the individual branchlets subtended by leafy bracts, calyx green, petals yellow, crinkled, clawed, *F5136*. SURINAM: frequent, rope in forest top, flowers yellow, dakama forest, bottom of Arrowhead Basin, Tafelberg, *24615;* vine, flowers yellow, opening in *Clusia* bush along escarpment, Tafelberg, *24632*. Guiana, Trinidad. In Surinam hitherto known but from two collections of the Weyne road.

BANISTERIOPSIS ELEGANS (Tr. et Pl.) Sandw. subsp. CORDATA (Ndz.) Sandw. var. PULCHERRIMA Sandw. BRITISH GUIANA: frequent vine twining over low trees, flowers yellow, glands green, Kaieteur Savanna, *23125*. Endemic.

STIGMATOPHYLLON CONVOLVULIFOLIUM (Cav.) Juss. (206). SURINAM: frequent, flowers yellow, along railroad near km. 70, *23604;* frequent, vine, petals orange-red, with yellow center, very showy, bush to rear of village Jacob kondre, Saramacca River, *23847;* vine, flowers yellow, buds orange-red, outer petal orange, red beneath, wallaba forest, vicinity Base Camp, Tafelberg Creek, *24110*. Northern Brazil, Guiana, Venezuela, West Indies. Throughout the country.

STIGMATOPHYLLON FULGENS (Lam.) Juss. (208). SURINAM: flowers yellow, saramas red, vicinity Sectie O, km. 68, *25000*. Northern Brazil, Guiana, Venezuela, West Indies. Throughout the country.

BRACHYPTERYS OVATA (Rich.) Small. (211). BRITISH GUIANA: vine, leaves herbaceous, flowers in short axillary fascicles, subtended by rounded leafy bracts, calyx green, paired glands brownish-green, petals ligulate, yellow, stamens green, stigmas green, inverted, boot-shaped, young fruit of 3 carpels, shaped like segments of an oval, Hacket Ck., R. B. lower Waini River N.W.D., *F5059*. SURINAM: low shrub, flowers yellow, open areas, coastal jungle, road to Carol Francois along Saramacca River, km. 79 from Paramaribo, *23598*. Coastal vegetation of South America and the West Indies; common in Surinam.

SPACHEA ELEGANS (G. F. W. Meyer) Juss. (213). SURINAM: infrequent, tree 12 m. tall, 15 cm. diam., leaves firm, glossy, pedicels pink, flowers subtended by 8 thick white glands, petals pink, white tipped, anthers yellow, below rapids, riverbanks, vic. Jacob kondre, Saramacca River *23814*. Guiana, Amazonian district, Trinidad, St. Vincent. Probably throughout the country.

The Byrsonimas of British Guiana have been treated by Sandwith in Kew Bulletin **1935** and in Journ. Arn. Arb. **24** (1943).

BYRSONIMA CRASSIFOLIA (L.) Rich. ex Juss. (226). BRITISH GUIANA: occasional, tree 5 m. high, 6 cm. diam., flowers yellow, inflorescence and young leaves rusty-tomentose, fruit yellow, from bush island, Kaieteur Savanna, *23260*. SURINAM: shrub to 3 m., flowers yellow, grass savanna, Zanderij II, *23697;* open bush, north escarpment, Tafelberg, *24328a;* infrequent, shrub to 3 m., flowers yellow, Savanna IV, Tafelberg, *24378;* frequent, shrub to 2 m., flowers yellow, Savanna VIII, Tafelberg, *24573;* frequent, shrub to 4 m. high, 5 cm. diam., flowers yellow, fruits without wings, Savanna II, Tafelberg, *24705;* flowers yellow, south savanna, vicinity Arawak village of Mata, *24964;* tree 8 m. high, 12 cm. diam., flowers yellow, savanna vicinity Sectie O, km. 68, *25021*. Central America, West Indies; Northern South America. Probably throughout the country.

BYRSONIMA CORIACEA (Sw.) Kunth (229). SURINAM: tree, 25 m. high, 35 cm. diam., inner bark thick, red, flowers yellow, hill no. 1 between North Ridge and Augustus creek, Tafelberg, *24724*. Tropical South America; West Indies. Probably throughout the country.

BYRSONIMA AERUGO Sagot (231). SURINAM: large tree, 25 m. tall, 40 cm. diam., flowers yellow, swampy bush to rear of Kwatta hede, *23921*. Guiana. In Surinam hitherto only collected in the forest reserves Brownsberg and Zanderij I.

BYRSONIMA GYMNOCALYCINA Juss. SURINAM: tree 20 m. tall, 10 cm. diam., glands pink in bud, opening in *Clusia* bush, between Savanna VIII and S. W. escarpment, Tafelberg, *24623*. New to Surinam, hitherto only known from British Guiana. The nearly allied *B. obversa* Miq. (241), known from Surinam, French Guiana and Pará, but apparently not extending to British Guiana, has been collected in several localities between the Marowijne River and the lower Coppenam River.

BYRSONIMA EUGENIIFOLIA Sandw. BRITISH GUIANA: occasional, tree 6 m. tall, 15 cm. diam., leaves leathery, calyx lobes and inflorescence crimson, fruit greenish, flushed crimson, paired glands grey on back, bush island, Kaieteur Savanna II, *23144* Endemic.

BYRSONIMA INCARNATA Sandw. BRITISH GUIANA: occasional, 16 m. tree, 30 cm. diam., fruit orange-yellow, fleshy, slightly astringent, edible, *Dicymbe* forest, Potaro River Gorge, *23535*. Endemic; third collection known.

VIOLACEAE

AMPHIRRHOX SURINAMENSIS (Miq.) Eichl. BRITISH GUIANA: tree to 12 feet high, flowers asymmetrical, anthers long-awned, mixed forest, Takutu Creek, Puruni River, Mazaruni River, *F2072* (*F.D. 4808*); tree 30 feet high, 4 inches diam., fruit trigonal-ovoid, young, greenish, flushed red, glossy, Takutu Creek, Puruni River, Mazaruni River, *F2151* (*F.D. 4887*); shrub to 12 feet high, secondary forest, Mabaruma, Aruka River, N. W. D. *F2427* (*F.D. 5163*).

CORYNOSTYLIS ARBOREA (L.) Blake. SURINAM: vine with milky sap, flowers long-spurred, white, frequent, bush to rear of Jacob kondre, Saramacca River, *23845;* vine, flowers white, fragrant, km. 5, Tafelberg Creek, Saramacca River Headwaters, *24892*. Variable and widespread, Mexico, West Indies to Peru and the Amazon Basin.

No. *24892*, because of its very thin, elliptic-obovate leaves with more numerous veins and longer, slender petioles, and solitary axillary flowers with the terminal in a simple raceme, seems hardly referable to *C. arborea* as it is represented in the herbarium of the New York Botanical Garden; yet in view of the polymorphy and lack of critical study of that species, it would be well to hold in abeyance any other disposition of the Tafelberg Creek collection.

PAYPAYROLA GRANDIFLORA Tul. BRITISH GUIANA: tree 20 feet high, 4 inches diam., Mahdia Creek, Potaro River, 108 mile, Bartica-Potaro Road, *F761* (*F.D. 3497*); shrub or small tree from Kakaralli clump, wallaba forest, 107 mile, Bartica-Potaro Road, *F1459* (*F.D. 4195*). Upper Amazon Basin, Brazil and Peru; new to British Guiana.

PAYPAYROLA LONGIFOLIA Tul. BRITISH GUIANA: small tree 10 m. high, 16 cm. diam., mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22828*. British Guiana.

PAYPAYROLA GUIANENSIS Aubl. SURINAM: small tree 4 m. high, flowers yellow, Campo Dungeoman, Saramacca River, 6 km. below mouth Toekoemoetoe Creek, *24058*. Surinam, French Guiana, Pará, Brazil.

RINOREA FLAVESCENS (Aubl.) Kuntze. BRITISH GUIANA: undergrowth tree to 30 feet high and 4 inches diam., mixed forest, Makauria Creek, Essequibo River, *F520* (*F.D. 3256*). Guiana; Amazon Basin, Brazil and Peru.

RINOREA MACROCARPA (Mart.) Kuntze. SURINAM: shrub or small tree

4 m. high, flowers white, montane forest, Kwatta Camp (no. 3) Coppenam River Headwaters, *24150*. Surinam; Amazon Basin, Brazil and Peru.

RINOREA PUBIFLORA (Benth.) Sprague and Sandw. BRITISH GUIANA: shrub of Mora forest, Barima River opposite Anabisi Creek, *F2463* (*F.D. 5199*); small tree 3–4 m. high, 4–5 cm. diam., occasional, mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22942*. SURINAM: shrub or small tree to 5 m. high, flowers white, border pina swamp, vicinity Krappa Camp (no. 2), Saramacca River Headwaters, *24122*. Guiana, Colombia, Brazil and Peru.

RINOREA RIANA (DC) Kuntze. BRITISH GUIANA: small undergrowth shrub with brown, pubescent, trigonal fruit, Siba Creek, Essequibo River, *F775* (*F.D. 3511*); small tree or shrub to 2 m. high, flowers white, fruit green, hairy, Kamuni Creek, Groete Creek, Essequibo River, March 27, 1944, *Fanshawe s.n.*, Colombia, Venezuela, Trinidad, Guiana.

RINOREA cf. C. FLAVESCENS (Aubl.) Kuntze. SURINAM: small tree overhanging Tafelberg Creek, vicinity Base Camp, *24894*, fruiting material only. Not matched at the New York Botanical Garden. Apparently closely related to *C. flavescens*, but hardly that species.

TURNERACEAE

TURNERA GLAZIOVII Urb. SURINAM: shrub or small tree, flowers yellow, frequent in low bush, vicinity Savanna III, Tafelberg, *24270; 24270a; 24271*. Our specimens conform reasonably well to the original description[97] based on *Glaziou 9852* and *9857* (Kew) from "Brasilia septentrionali;" and to a photograph of *Glaziou 9852* made at Berlin. No authentic specimens of *T. Glaziovii* have been seen.

BEGONIACEAE[98]

BEGONIA GLABRA Aubl. SURINAM: frequent, climbing to 30 feet, high forest, base of south cliffs, Arrowhead Basin, 625 meters altitude, Tafelberg, *24477*. Southern Mexico and the West Indies to Guiana, Bolivia and Peru.

BEGONIA JENMANI Tutin. BRITISH GUIANA: frequent, rocky ground, trail Tukeit to Kaieteur, Potaro River Gorge, *23081;* moist rocks, Potaro River Gorge, *23530*. Known only from the type region.

BEGONIA PRIEUREI A. DC. BRITISH GUIANA: weed beneath rest house, Kaieteur Falls, *23470*. SURINAM: common, wet moss-covered walls and damp soil, base of north escarpment, Tafelberg, *24329;* locally frequent, high mixed forest, vicinity of Augustus Falls, base of north escarpment, Tafelberg, *24760*.

LECYTHIDACEAE

COURATARI MULTIFLORA (Smith) Eyma. BRITISH GUIANA: tree 6 m. high, 10 cm. diam., fruit green before opening, afterwards brown, seed winged, frequent, riverside, Potaro River Gorge, below Amatuk Portage, *23555;* tree 12 m. high, 20 cm. diam., Potaro River Gorge, below Tukeit, *23501*. Apparently confined to British Guiana.

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[97] Monog. Turneraceae, 1883.

[98] By Lyman B. Smith and Bernice G. Schubert.

ESCHWEILERA CORRUGATA (Poit.) Meirs. SURINAM: small tree overhanging Tafelberg Creek, 5 km. below Base Camp, *24902;* tree 12 m. high, 20 cm. diam., Kwatta hede, Saramacca River, *23943*. Generally distributed in Guiana.

While *23943* is probably properly referred to this species, its leaves are almost imperceptably reticulate, not conspicuously so as in all other specimens of the species that I have seen, and its pedicels are not at all warty, the conspicuous character that gives rise to the name *E. corrugata*. It is suspected that our collection may represent a distinct variety.

ESCHWEILERA HOLCOGYNE Sandw. BRITISH GUIANA: tree exceeding 100 feet high, 4 feet diam., non-buttressed, mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22916*. British Guiana; little collected.

The original description[99] was made with fruit unavailable. The postmature pyxidia of the above collection are broadly obovate 6–7 cm. long, 5–7 cm. broad, usually somewhat asymmetrical, the bases truncate, the opercula disciform, 4–5 cm. in diam., and the sepal scars prominent. The seeds are 3–3.5 cm. long, about 2 cm. wide, elliptic-oblong, the outer face convex, the inner single or two faces plane, the testa brown, deeply sculptured.

ESCHWEILERA LABRICULATA Eyme. SURINAM: small tree 4 m. high, 6 cm. diam., flowers pink, anthers white, androecial hood flat, basally bearing fertile anthers, frequent, swampy bush to the rear of Kwatta hede, Saramacca River, *23911*. Sparingly known from Surinam only.

ESCHWEILERA LONGIPES (Poit.) Miers. SURINAM: small tree 10 m. high, 15 cm. diam., flowers totally deep pink, Tafelberg Creek, 8 km. below Base Camp, *24075;* Tafelberg Creek *24907*. Generally distributed in Guiana.

GUSTAVIA ANGUSTA Alm. BRITISH GUIANA: tree 10 m. high, 10 cm. diam., flowers white, Mora forest, Kamuni Creek, Groete Creek, Essequibo River, *22888*. SURINAM: frequent, riverbanks, Saramacca River above Kwatta hede, *23930*. Highly variable and widely distributed in northern South America.

MYRTACEAE[100]

The present report on the Myrtaceae collected by Maguire and by Maguire and Fanshawe in Surinam and British Guiana is at the same time a second paper preliminary to my account of the Myrtaceae in the Flora of Surinam. I have referred to this as yet unpublished account by citing the number of the genera and the species. The first preliminary paper appeared in 1942 as no. 86 of the "Mededelingen van het Botanisch Museum en Herbarium van de Rijksuniversiteit te Utrecht." The remaining new and critical species will be dealt with in a third preliminary paper.

CALYPTRANTHES FASCICULATA Berg (I 2). BRITISH GUIANA: shrub or small tree to 15′ with many shoots, leaves chartaceous, rufous-tomentose beneath, fruits clustered in axils, stalked, globose, dull purplish, covered with rufous or grey indumentum, seed one, Takutu Creek to Puruni River, Mazaruni River, *F.D. 4758; 4759*. Trinidad, Venezuela, Br. Guiana, Surinam.

CALYPTRANTHES LUCIDA Mart. ex DC. (I 4). SURINAM: tree to 15 m. high, 18 cm. diam., wood white, hard, flowers white, mixed high forest, base

[99] Kew Bull. 1935: 126.

[100] By G. J. H. Amshoff.

north escarpment, Tafelberg, *24300;* frequent, tree to 20 m. high, 30 cm. in diameter, flowers whitish, opening by Grace Falls, Arrowhead Basin, Tafelberg, *24491;* frequent, tree to 10 m. high, 15 cm. in diam., flowers white, overhanging stream, high forest East Ridge Gorge, Tafelberg, *24542;* frequent, tree 18 m. high, 25 cm. diam., flowers white, immature fruit red, mixed high forest, base of cliffs, west escarpment, Tafelberg, *24691;* tree 15 m. high, 20 cm. diam., immature fruit red, mixed high forest, base of cliffs, west escarpment, Tafelberg *24692.* Southern and central Brazil (Berg), not otherwise collected in Guiana, but probably still more widely distributed. Unfortunately, I could not compare the type, but the specimens agree well with Berg's detailed description and with a photo of the type.

CALYPTRANTHES cf. C. PULCHELLA DC. (I 6). SURINAM: common, small tree 12 m. high, 8 cm. diam., flowers white, diabasic soil, mixed high forest, Hill No. I, Tafelberg, *24714* fl. Sept.; small tree to 8 m. high, 4 cm diam., flowers whitish, low bush, Savanna No. II, Tafelberg, *24267.* Mr. R. Weibel of the Geneva herbarium has been so kind as to compare a fragment of Maguire *24714* with the type of *C. pulchella* DC. He writes that the type specimen is unfortunately imperfect and does not allow a certain identification. The glandular dots on the undersurface of the leaves of *Maguire 27714* are less abundant than in the type, the flower buds more pointed and more densely pubescent. Yet, as Berg in Mart. Fl. Bras. XIV 1 p. 14 has already described two varieties, it is possible that the Tafelberg specimens too fall within the variability of the species.

Marlierea salticola Amsh. sp. nov. Frutex ramosissimus ramulis subteretibus cito glabratis. Folia anguste oblonga vel oblanceolata, basi acuta, apice obtusa, novella sparse pilosa pilis dibranchiatis, adulta glabra, dense ± elevato-punctata, coriacea, usque ad 7 cm. longa 2 cm. lata, costa supra leviter impressa subtus valde prominenti nervis lateralibus numerosis tenuibus utrinque prominulis nervo marginali vix 1 mm. a margine distanti, petiolo circ. 3 mm. longo. Inflorescentiae pauciflorae circ. 5-florae subglabrae folio breviores ± 2 cm. longae bractea lineari ± 8 mm. longa suffultae. Alabastra clausa, ± fusiformia, obtusa, — 5 mm. longa basi sparse pilosa ceterumque glabra. Petala nulla? Ovarium 2-loculare 4-ovulatum ovulis ascendentibus. Fructus globosus margine libero receptaculi et calyce lacerato coronatus monospermus in sicco – 8 mm. in diametro, cotyledonibus contorto-plicatis, radicula elongata, geniculata.

TYPE: locally common, erect shrub to 3 m., flowers white, Amatuk Portage, Potaro River Gorge, British Guiana, May 19, 1944, *Maguire & Fanshawe 23549.* Kangaruma, Potaro R., on rocks in falls, *Abraham 377* fr. Oct. 1922 (K). Probably allied to *M. montana* (Aubl.) Amsh., but quite distinct by the form and indumentum of its flower buds and by its narrow leaves. The species is possibly, as are so many *Psidium* species, restricted to the river bed.

MARLIEREA SCHOMBURGKIANA Berg (II 1). BRITISH GUIANA: frequent, tree 15 m. high, 15–30 cm. diam., fruit blue, edible, sweet, mixed woodland, Kamuni Creek, Groete Creek, Essequibo River, *22911.* Frequent throughout British Guiana, once collected in Surinam.

Marlierea buxifolia Amsh. sp. nov. Arbor parva vel frutex ramosissimus ramulis novellis villosis. Folia obovato-oblonga, apice obtusa vel ro-

tundata basi acuta, novella utrinque pubescentia adulta supra glabra subtus pubescentia, coriacea, margine revoluta, circ. 4 cm. longa 2 cm. lata, costa supra impressa subtus valde prominenti, nervis venisque obsoletis. Petiolus circ. 3 mm. longus. Inflorescentiae in axillis foliorum superiorum saepe bracteiformium, albido-villosae, 2–3 cm. longe pedunculatae, 3- vel 5-florae; floribus sessilibus, terminalibus ternis 2 inferioribus saepe additis, bracteis subulatis alabastra aequantibus. Alabastra villosa apice acuminata clausa. Calyx in flore aperto irregulariter laceratus. Petala orbicularia circ. 2 mm. longa. Ovarium 2-loculare 4-ovulatum. Fructus immaturus subglobosus, maturus ignotus.

TYPE: Kaieteur savanna, thicket on rocky ground, *Sandwith 1340* fl. Sept., low tree, leaves coriaceous, box-like, very dark green above, greyish-glaucous beneath, petals and filaments white (U, K). Cotype: Kaieteur savanna, bush island, *Maguire and Fanshawe 23272* defl.; shrub 1–2 m. high, leaves narrow, oblong, margin revolute, inflorescence woolly, fawn-colored. Kaieteur savanna, *Jenman 1245* fl. Sept./Oct. 1881; 3–4 feet high (K). A very distinct species, well characterized by its few-flowered inflorescences and by its indumentum.

MARLIEREA MONTANA (Aubl.) Amsh. (II 2). SURINAM: frequent, shrub to 1.5 m. high, flowers white, wet sand, savanna, Zanderij I, *23715* fl. June; shrub about 5 m. high, savanna vicinity Sectie O, km. 68, *25015;* shrub or tree to 8 m. high, fruit edible, south savanna, Arawak village of Mata, *24986;* frequent, shrub or small tree up to 10 m. high, Tafelberg, *24444, 24643, 24656, 24790, 26173.* Guiana. Frequent in Surinam and British Guiana, rarely collected in French Guiana. (*Aublet s.n.* [B M], type of *Eugenia montana* Aubl., herb. Richard [P], type of *M. Richardiana* Berg).

Marlierea cuprea Amsh. sp. nov. Arbor parva ramulis gracilibus novellis compressis sericeis. Folia elliptico- vel obovato-oblonga, basi acuta, apice abrupte acuminata, tenuiter coriacea, subnitida, supra glabra, subtus sericea, glabrescentia, 6–10 cm. longa 3–4 cm. lata, obscure pellucido-punctata, costa supra impressa subtus prominenti, nervis lateralibus tenuissimis supra fere obsoletis subtus vix prominulis nervo marginali circ. 1 mm. a margine remoto, venis obsoletis. Petiolus canaliculatus demum transverse rugosus – 5 mm. longus. Inflorescentiae axillares paniculatae cupreo-sericeae foliis aequantes vel longiores multiflorae, bracteis parvis acutis deciduis, floribus subsessilibus. Alabastra obovoidea apice breviter 4-loba extus sericea – 3 mm. longa. Receptaculum supra ovarium valde productum demum ad verticem ruptum. Sepala brevissima, semilunaria, utroque latere sericea. Petala 4, vix 2 mm. longa. Ovarium 2-loculare 4-ovulatum disco glabro terminatum. Fructus globosus, glabrescens, margine libero receptaculi saepe 8-fisso sepalisque coronatus, in sicco circ. 8 mm. in diametro, monospermus; cotyledonibus plicatis, radicula elongata plicata.

TYPE: Kurupung, Upper Mazaruni River, *Herbert Leng 298* fl. Dec. New York Botanical Garden. *Leng 212* fl. Nov. (NY); Makrebafalls, Kurupung River, *Pinkus 261* fr. (NY); Macouria creek, *Jenman 2389* fl. Nov. (NY, K); ibidem, *2388* (K); *F.D. (Anderson) 295* fl. fr. March (K). Nearly allied to *M. insculpta* Diels, this latter species differing by its larger leaves, in which the lateral nerves are impressed above and the venation more prominent beneath. *Aulomyrcia tobagensis* (Kr. et Urb.) Amsh., of which the adult flowers are not known, is also very similar in leaf-characters

and general habit, but its flowers are glabrous and ± long-pedicelled. Among the Guiana species only *M. Guildingiana* Griseb., with quite glabrous inflorescences, has a similar structure of the calyx.

AULOMYRCIA DIVARICATA Berg (IV 4). BRITISH GUIANA: undergrowth tree 30′ high, 6″ diam, with red papery bark and very hard, fine-grained wood from Kakaralli bush on brown sand, flowers white, bunched 3 and 4 together at ends of branchlets of a compound panicle, stamens white, ovary and buds greenish, Mazaruni Station, *F.D. 3368*. Also collected along the Corantijne River in British Guiana and along the Surinam River in Surinam.

AULOMYRCIA LUCIDA Berg var. (IV 6). SURINAM: frequent, tree 8 m. high, 10 cm. in diam., flowers white, fruit red, mixed high forest, base of cliffs, west escarpment, Tafelberg, *24693*. Described from Southern Brazil. Maguire *24693* comes very near the var. *grandifolia* Berg, but the flowers are somewhat larger and the venation more obsolete.

Aulomyrcia citrifolia (Aubl.) Amsh. comb. nov., *Myrtus citrifolia* Aubl., Pl. Guiane Fr. **1**: table des noms 20. 1775, **2**: 513, no. 4. 1775. *Myrcia citrifolia* (Aubl.) Urb. in Fedde Rep. **16**: 150. 1920; *Myrcia paniculata* (Jacq.) Kr. et Urb. in Engl. Bot. Jahrb. **19**: 577. 1895. (IV 7). SURINAM: frequent, shrub 2 m. high, fruit red, Savanna II, Tafelberg, *24703;* frequent, shrub to 2 m. high, flowers white, Savanna VIII, Tafelberg, *24526;* frequent, shrub to 2 m., inflorescence and buds red, flowers white, Savanna VIII, extensive rock and pigmy bush openings, Tafelberg, *24442;* shrub to 2 m., leaves obovate, flowers white, Savanna II, Tafelberg, *24229*. West Indies, Brazil (Kiaersk). I can find no significant differences between the variable Tafelberg collection and the also variable West Indian form. The species is not otherwise known from Guiana, unless *Aulomyrcia triflora* Berg, in which the greatest width of the leaves tends to be below the middle instead of above the middle, has to be considered as a variety. The type of *A. triflora* Berg is *Rich. Schomburgk 978 = Rob. Schomburgk 644*, but the inflorescence is not on all sheets of this collection so contracted and few-flowered as described by Berg. A lax-flowered form with the leaves of *A. triflora* Berg has been collected by *Pinkus 33*, [N. Y.] and *F. D. 2785*, [K], along the Membaru Creek, Upper Mazaruni River in British Guiana.

AULOMYRCIA OBTUSA (Schauer) Berg (IV 8). SURINAM: frequent, shrub to 2–3 feet high, divaricate, flowers white, wet sand, Zanderij I, *23724;* shrub, wet sand, savanna, Zanderij I, *23728a;* shrub, south savanna, vicinity Arawak village of Mata, *24961;* shrub to 3 m. high, flowers white, fruit red, savanna vicinity Sectie O, km. 68, *25019*. With several varieties from Brazil to Trinidad, especially frequent in Surinam, not yet known from French Guiana.

Aulomyrcia platyclada (DC.) Amsh. comb. nov., *Myrcia platyclada* DC., Prodr. **3**: 224. 1828; *Aulomyrcia dumosa* Berg in Linnaea **30**: 656. 1861; *Myrcia dumosa* (Berg) Kr. et Urb. in Engl. Bot. Jahrb. **19**: 580. 1895. British Guiana; im Walde unterhalb des Roraima, *Ule 8672* (U, L, K). Martinique, Guadeloupe, Trinidad, Tobago, British Guiana, Surinam, French Guiana. I was able to compare a fragment and a duplicate of the type of *Myrcia platyclada* DC., collected by Patris in French Guiana. *Aulomyrcia dumosa* Berg was described from French Guiana also; its type, with flowers and fruits, has been studied by Urban in the Berlin

herbarium. I studied the West Indian specimens identified by Urban as *A. dumosa* Berg and a photo of the (fruiting) duplicate type in the Paris herbarium.

Var. **kaieteurensis** Amsh. var. nov. A typo differt foliis rigidioribus obsolete venosis inflorescentia glabra.

TYPE: frequent, shrub to 4 m. high, 2–3 cm. diam., lax open growth, inflorescence reddish, flowers not open, from bush island on savanna, Kaieteur Plateau, *Maguire & Fanshawe 23268*. Cotypes: frequent, shrub to 2 m., 2 cm. diam., fruit oblong-globose, crimson, from bush island on savanna, Kaieteur Plateau, *Maguire & Fanshawe 23300;* Kaieteur savanna, thickets on rocky ground, alt. 1200 feet, small tree, fruit dull red, leaves leathery, *Sandwith 1334* (U, K). A rather distinct form, perhaps deserving more than varietal rank, but with the characteristic flattened rachis of the inflorescence to which the specific name refers.

AULOMYRCIA HOSTMANNIANA Berg (IV 10). SURINAM: shrub to 4 m. high, flowers white, south savanna, vicinity Arawak village of Mata, *24978*. Frequent throughout British Guiana and Surinam; also cited for northern Brazil (Kiaersk).

Aulomyrcia albido-tomentosa Amsh. sp. nov. (IV 17). Frutex vel arbor para ramulis dense albido-tomentoso-pubescentibus. Folia ovato-oblonga, apice breviter acuminata basi acuta et in petiolum attenuata, chartacea vel coriacea, juniora albido-pilosa adulta glabra utrinque praesertim subtus conspicue impresso-punctata 5–9 cm. longa 2–4 cm. lata costa supra impressa subtus prominente nervis lateralibus numerosis inconspicuis utrinque tenuiter impressis nervo marginali circ. 1 mm. a margine remoto venis obsoletis. Petiolus usque ad 5 mm. longus. Paniculae axillares et terminales pauciflorae interdum racemiformes folio breviores, pubescentes. Flores tetrameri; receptaculum supra ovarium productum extus dense albido-pubescens intus margine inter stamina breviter pubescenti excepto glabrum. Sepala imbricata 2 exteriora 2 interiora, ciliata, extus sparse pubescentia intus sericea 1 mm. longa. Petala 4, orbicularia 2½ mm. longa. Ovarium 2- loculare 4-ovulatum, ovulis ascendentibus. Baccae (immaturae tantum adsunt) globosae; cotyledones liberae; radicula elongata.

TYPE: Kaieteur savanna, British Guiana, thickets on rocky ground, alt. 1200 feet, *Sandwith 1392* fl. Sept. 1937, (U, K). A small tree, flowers white, ibidem, *Sandwith 1344* fl. Sept. (U, K). COTYPE: frequent, small tree 10 m. high, 10 cm. diam., overhanging lower Augustus Creek, Tafelberg, Surinam, *Maguire 24734*, defl. Sept. SURINAM: frequent, tree 10 m. high, 10 cm. diam., transition high-low bush, 5 km. southwest of Savanna I, Tafelberg, *Maguire 24783* defl. Sept.; small tree to 8 m. high, 5 cm. diam., flowers white, dense, wet, low bush north of Savanna III, Tafelberg, *Maguire 24274* fl. (buds) Aug.

A very distinct species, well characterized by its indumentum and its conspicuously punctate leaves. Because of its 4-merous flowers it belongs to that artificial group of *Aulomyrcia* species, formerly united by Berg to the genus *Myrciaria* Berg as "series paniculatae."

AULOMYRCIA MINUTIFLORA (Sagot) Amsh. (IV 18), *Myrcia minutiflora* Sagot in Ann. Sc. Nat. 6^{20}: 185. 1885. BRITISH GUIANA: slender shrub 3–5 m. high, dense forest, northern slope of Akarai Mountains, *A. C. Smith*

2902. Otherwise known to me only from the type collection, made by Mélinon on the French side of the Marowijne River. The species is readily recognizable by its caudate leaves and few-flowered inflorescences; in fruiting specimens often only one fruit of an inflorescence is developed, thereby reminding one of a Eugenia. The minute flowers are 4-merous, the sepals hardly imbricate, and, as Sagot suggested, this species is rather similar to some Marliereas.

MYRCIA BRACTEATA (Rich.) DC. (V 1). SURINAM: frequent, small tree to 5 m. high, in medium bush, 2 km. south of East Ridge, Tafelberg, *24598*. Guiana (apparently only in the interior), n. Brazil, e. Peru.

MYRCIA SYLVATICA (Mey.) DC. (V 2). BRITISH GUIANA: occasional, 3 m. tree, 3 cm. diam., buds reddish, all parts pubescent, of bush island on savanna, Kaieteur Plateau, *23440*. SURINAM: frequent, shrub or small tree, flowers white, along southwest escarpment, Tafelberg, *24637*. Guiana and Brazil, one of the most common and best known species.

MYRCIA FALLAX (Rich.) DC., Prodr. **3**: 224. 1828; Berg in Linnaea **27**: 98. 1855; *Eugenia fallax* Rich. in Act. Soc. hist. nat. Paris **1**: 110. 1792; *Myrcia Berberis* DC., Prodr. **3**: 244. 1828; Berg in Mart. Fl. Bras. **14**[1]: 170. 1857; *Myrcia Kegeliana* Berg **14**[1]: 168. 1857. (V 4). BRITISH GUIANA: occasional, 5–8 m. tree, 10 cm. diam., leaves stiff, leathery, fruit purple-black ripe, white-suffused, pale magenta when young, from low wallaba bush, Kaieteur Plateau, *23212;* frequent to common, 6 m. tree, 10 cm. diam., leaves chartaceous, fruit oblong, red-mauve, not yet ripe, leaning over river, Kaieteur Plateau, *23304*. The type of *Eugenia fallax* Rich. was collected by Leblond in French Guiana; there is a sheet in the Herbarium Delessert, Genève, with flowers and young fruits, and one in the Herbarium Richard, now incorporated in the Paris herbarium, with young fruits only. The specimen described by Berg in 1855 came from the Herbarium Willdenow (B); it is possibly the same species but probably not collected by Leblond. Widely distributed from the West Indies to Brazil.

MYRCIA DEFLEXA (Poir.) DC. (V 5). SURINAM: tree 20 m. high, 30 cm. diam., fruit turning white, high bush, south cliffs Arrowhead Basin, Tafelberg, *24455;* frequent, small tree, flowers white, twigs red-tawny, high forest, south slopes, Arrowhead Basin, Tafelberg, *24602*. West Indies, Venezuela, Guiana, Brazil. To this species also belongs *Myrcia crassinervia* DC., Prodr. III (1928) p. 245, described from French Guiana; I was able to consult a duplicate and a fragment of the type.

Myrcia tafelbergica Amsh. sp. nov. (V 6). Frutex vel arbor parva. Ramuli juniores dense rufo-velutini. Folia ovata vel oblonga, basi obtusa, acuta vel rotundata, apice acuminata, 2–8 cm. longa 1–3. 5 cm. lata, juniora sparse pilosa, adulta costa excepta glabra, coriacea, in sicco ± rugosa, costa supra impressa, subtus prominente, nervis lateralibus venisque obsoletis. Petiolus robustus, 5 mm. longus. Paniculae axillares et subterminales, rufo-velutinae, pauciflorae, usque ad 4 cm. longae. Flores 7–9 mm. in diametro; receptaculum extus sericeum; sepala utrinque sericea; petala extus pubescentia. Ovarium 2-loculare disco sericeo terminatum. Bacca subglobosa, disperma, glabrescens, cotyledonibus plicatis, radicula elongata.

TYPE: frequent, shrub to 4 m. high, leaves opposite, acuminate, flowers white, extensive rock and pigmy bush openings, alt. 776 m., Savanna VIII, Maguire *24441*. COTYPE: frequent, shrub to 3 m. high, leaves acuminate,

flowers white, Savanna VIII, Tafelberg, 776 m. alt., *Maguire 24572*. SURINAM: frequent, small tree in open low bush between camps 2 and 1, Tafelberg *24647;* small tree, low bush, Savanna II, *24235;* frequent, shrub to 3 m., leaves acuminate, flowers white, Savanna II, *24233;* tree in moeri-moeri, *Geyskes* 988 fr. (U). Closely allied to *M. Schomburgkiana* Berg, the latter species differing by its narrower leaves with acuminate base, prominulous venation, slender petiole, and, as far as known, by its narrowly ellipsoid, 1-seeded fruit.

MYRCIA SCHOMBURGKIANA Berg (V 7). BRITISH GUIANA: frequent to common, tree to 6 m. high, fruit reddish, usually drooping over river, secondary forest on white sand, Waratuk Falls, Potaro River Gorge, *23039*. The specimen is imperfect and the determination therefore somewhat tentative. Frequent in British Guiana; once collected along the French side of the Marowijne River; not yet known from Surinam.

CALYCORECTES GRANDIFOLIUS Berg (VIII 1). SURINAM: infrequent, small tree, leaves chartaceous, fruit pale buff, Saramacca River banks below rapids, Jacob kondre, *23834;* frequent, shrub to 2 m. high, fruit becoming cream-colored, dakama forest, bottom of Arrowhead Basin, Tafelberg, *24619*, a somewhat aberrant, small-leaved form. Surinam and French Guiana, (a.o. *Sagot 943* [P, U, K], *Benoist 430* [P], *Wachenheim 480* [P]; *Poiteau s.n.* [G. DEL]; *Martin s.n.* [P]). Confused by Miquel in Linnaea XXII (1849) p. 172 and Stirpes Sur. Sel. (1850) p. 39 and by Sagot in Ann. Sc. Nat. 6.20 (1885) p. 193 with *Eugenia ramiflora* Desv., which is a true Eugenia.

CATINGA MOSCHATA Aubl. *Calycorectes latifolius* (Aubl.) Berg in Linnaea **30**: 701. 1861 quoad descript. tantum, non quoad nomen; *Calycorectes Bergii* Sandw. in Kew Bulletin (**1932**) 212. (IX 2). BRITISH GUIANA: frequent, large tree, dense second growth, in windfall opening, heavy *Mora* forest, Kamuni Creek, Groete Creek, Essequibo River, *22925;* frequent, tree 18 m. high, 20 cm. diam., dense second growth in windfall opening, heavy *Mora* forest, Kamuni Creek, Groete Creek, Essequibo River, *22865*. Guiana. This and a second interesting species of the same genus will be discussed in a later paper.

PLINIA DUSSII (Kr. et Urb.) Urb. *Marlierea Dussii* Kr. et Urb. SURINAM: tree to 12 m. high, 25 cm. diam., flowers white, low bush, vicinity of Savanna II, Tafelberg, *24263;* rare shrub to 4 m. high, flowers white, border pigmy bush, Savanna VIII, Tafelberg, *24425*. Guadeloupe, Martinique. Not otherwise known from Guiana or the continent. I am convinced that the species does not belong to the genus *Plinia* L., but prefer to await the examination of fruiting material before making a transfer.

EUGENIA WENTII Amsh. (XI 1). SURINAM: slender tree to 5 m. high, 5 cm. diam., sepals green, petals white, high mixed forest, overhanging stream, North Ridge Creek, Tafelberg, *24665*. Surinam and French Guiana.

EUGENIA ATROPUNCTATA Steud. (XI 11). SURINAM: shrub or small tree, flowers white, pink in bud, riverside above Posoegronoe, Saramacca River, *24037;* frequent, small tree, flowers white, vicinity island camp, Toekoemoetoe Creek, *24072*. Surinam and East Peru.

EUGENIA EURYCHEILA Berg. BRITISH GUIANA: tree to 5 m. high, low forest, basin of Rupununi River, Karenambo, *A. C. Smith 2213;* slender tree 5 m. high, petals and filaments white, edge of forest, basin of Rupununi River, near mouth of Charwair Creek, *A. C. Smith 2355;* slender tree 3–4 m.

high, on exposed rock ledges, western extremity of Kanuku Mountains, in drainage of Takutu River, dense forest, *A. C. Smith 3135;* slender shrub 3 m. high, mature fruit rich brown, northwestern slopes of Kanuku Mountains, in drainage of Moku-Moku creek (Takutu tributary), dense forest, *A. C. Smith 3379*. Otherwise only known from the type collection (Rupununi River, British Guiana, *Rich. Schomburgk 1295* [P]).

EUGENIA BIFLORA L. var. (XI 9). BRITISH GUIANA: shrub or small tree to 6 feet tall, leaves linear, thick, somewhat leathery, pubescent beneath, flowers in terminal inflorescences, white, stamins numerous, fruit yellow, globose, topped by calyx remains, Takutu Creek to Puruni River, Mazaruni River, *F. D. 4909*. Very similar to the French Guiana form, described by Sagot as *E. myriostigma* Sagot.

EUGENIA EXCELSA Berg (XI 29). BRITISH GUIANA: shrub or small tree, leaves leathery, flowers in groups in the axils, buds pinkish, flowers white, Takutu to Puruni River, Mazaruni River, *F. D. 4827*. Not otherwise known from British Guiana. Surinam and Brazil.

EUGENIA RAMIFLORA Desv. ex Hamilton, Prodr. Fl. Ind. Occ. 44. 1825; *Eugenia brachypoda* DC., Prodr. **3**: 274. 1828; *Eugenia fulvipes* Sagot in Ann. Sc. Nat. 6^{20}: 189. 1885. (XI 17). SURINAM: slender shrub to 4 m. high, densely shaded lateral channel along riverbanks en route to Kwatta hede, Saramacca River, *23953;* tree 4 m. high, flowers pink to white, in virgin forest along the Saramacca River, *Pulle 408* (U). FRENCH GUIANA: Marowijne River, *Mélinon s.n.* (P, K, NY), type of *Eugenia fulvipes* Sagot; ididem, *Wachenheim 17* (P). The types of *E. ramiflora* Desv. and *E. brachypoda* DC. were also collected in French Guiana, but the collector and the locality are not known. I have now been able to examine the types, thanks to the courtesy of the Director of the Paris Herbarium. The specimen has been well preserved and the photo is quite distinct, so that I have no doubt of its identity. Of *E. brachypoda* DC. I was able to examine a fragment and a duplicate (in G-DEL) of the type. It appears that *E. brachypoda* DC. was not correctly interpreted by Sagot in Ann. Sc. Nat. 6^{20}: 190. 1885, and consequently by myself in Med. Bot. Mus. & Herb. Utrecht 86 (1942) p. 162; the specimen of Leprieur, cited by Sagot, belongs in reality to *E. chrysophyllum* Poir. *E. ramiflora* Desv. is among the Guiana species of *Eugenia* well characterized by the arachnoid pubescence of the young leaves and by the short sepals; the arachnoid hairs are persistent on parts of the lower surface of the adult leaf. The Amazonian *E. Ferreireana* Berg is, however, very closely allied.

var. **montana** Amsh. var. nov. A typo differt foliis angustioribus longe falcato-acuminatis demum totis glabratis.

TYPE: slender tree or shrub to 4 m., rim Arrowhead Basin, 725 m. alt., Tafelberg, *Maguire 24481* fr. Aug. Surinam, Emmarange, top II, *B. W. 5700* fl. Nov., (U).

Eugenia tafelbergica Amsh. sp. nov. Frutex vel arbor parva ramulis novellis sulcato-compressis adpresse-pubescentibus, demum subteretibus glabratis. Folia oblonga apice longe acuminata basi in petiolum attenuata, membranacea, novella utrinque sparse breviter adpresse-pubescentia, glabrescentia, adulta glabra, 8–12 cm. longa 3–4 cm. lata, minute dense pellucido-punctata, costa supra impressa subtus prominente nervis lateralibus utroque latere 12–14 supra prominulis, nervo marginali 2–3 mm. a mar-

gine remoto, venis reticulatis. Petiolus canaliculatus ad 1 cm. longus. Flores fasciculati vel breviter racemosi, 2–4-ni, interdum solitarii, bracteis minutis suffulti, pedicellis sericeis 6–10 mm. longis. Bracteolae triangulari-ovatae minutae. Sepala extus sparse adpresse-pubescentia, intus sericea, semiorbicularia, in alabastro petala includentia, inaequalia, exteriora 2 mm., interiora fere 3 mm. longa. Petala fugacia. Ovarium adpresse-pubescens, 2-loculare, loculis circ. 8-ovulatis. Fructus ignotus.

TYPE: shrub, flowers white, opening in *Clusia* bush, 1 km. west of East Ridge, Tafelberg, *Maguire 24599* fl. Sept. COTYPE: tree to 5 m. high, 6 cm. diam., flowers white, in medium bush, 1.5 km. south of East Ridge, *Maguire 24583* fl. Sept. closely allied to *Eugenia armeniaca* Sagot from French Guiana. This latter species differs by its leaves, which even when adult are densely sericeous beneath, by the lateral nerves, which are conspicuously arcuate-anastomosing, and by its subterete petiole. The flowers and inflorescence are very similar.

Eugenia kaieteurensis Amsh. sp. nov. Frutex ramulis compressis, minute puberulis, glabrescentibus. Folia obovata, apice rotundata interdum leviter emarginata vel brevissime obtuse acuminata, basi acuta, coriacea, 9–14 cm. longa 4–7 cm. lata, discoloria, supra glabra subtus pallidiora minute puberula, costa supra plana subtus prominenti, nervis lateralibus circ. 10 supra prominulis subtus leviter prominentibus, nervo marginali 1–2 mm. a margine remoto, venis laxe reticulatis utrinque prominulis. Petiolus crassus subteres 5–8 mm. longus. Inflorescentiae breviter fasciculato-racemosae, rachi usque ad 5 mm. longa, pluriflorae; bracteae minutae, deciduae; pedicelli brunneo-sericei, 3–10 mm. longi; bracteolae ovatae, vix 1 mm. longae; receptaculum brunneo-sericeum; sepala rotundata, utrinque minute sericea, parum inaequalia, 1.5–2 mm. longa. Petala membranacea, glabra, ± 3 mm. longa. Ovarium 2-loculare, loculis in flore unico dissecto 7-ovulatis. Fructus oblongo-ellipsoideus, puberulus, immaturus 12 mm. longus 7 mm. in diametro, monospermus, embryo homogeneus.

TYPE: a tree 15 or more feet high, Kaieteur Savanna, Potaro River, British Guiana, *Jenman 808* fl. Sept./Oct. 1881 (K). COTYPE: Kaieteur Plateau, bush island in savanna, rare 2 m. shrub, fruit oblong, pale-orange, *Maguire & Fanshawe 23444* fr. May 1944. Evidently closely allied to *E. Baileyi* Britton of Trinidad, the leaves very similar, but differing by its pedicellate flowers and fruits, the shorter indumentum of the inflorescence, and the somewhat smaller flowers.

EUGENIA COMPTA Berg in Linnaea **31**: 677, 1861; *Eugenia Prieurii* Berg in Linnaea **30**: 681. 1861; *Eugenia Prieurei* Sagot in Ann. Sc. Nat. **6**[20]: 188. 1885. (XI 23). SURINAM: along rail-road near km. 70, *23613;* and a few other collections. FRENCH GUIANA: vicinity of Cayenne, in bush along public road, *Broadway 256* fr. May (NY); hill above Grants Road, *Broadway 756* fr. July (NY); *Broadway 417* fr. June (NY); Sinnamarie, Béna? *2306* (U); without locality, *Richard s.n.* (P), type of *E. compta* Berg; *Leprieur s.n.*, type of *E. Prieurii* Berg and *E. Prieurei* Sagot (P, BM, L, NY, U); *Mélinon 74* (U); *Gabriel* anno 1802 (G-DEL); *Poiteau s.n.* (G-DEL); *von Rohr 171 and 214* (BM).

EUGENIA ANASTOMOSANS DC. (XI 25). BRITISH GUIANA: occasional, small tree 3 m. high, fruit oblong-ovoid, black, glossy, crowned by dark green calyx lobes, fruit edible, astringent, Kaieteur Plateau, *23197;* rare,

small tree to 5 m. high, 5 cm. diam., leaves leathery, calyx dark green, fruit oblong, black, fleshy, 2×1.5 cm., rocky *Dicymbe* forest, trail from Tukeit to Kaiateur Falls, on Kaieteur escarpment, *23074;* a small tree, flowers on old wood, petals white, in forest on white sand, Potaro River, between Garraway stream and Kangaruma, *Sandwith 1238* (U, K); shrub, 10 feet, flowers white, Demerara County, on white sands, along the Berbice-Rupununi Cattle Trail, *Abraham 310* and *319* (NY); Berbice River, *Hohenkerk 295C* (K); Winiperu Creek, Demerara River, *F. D. 3110* (K). SURINAM: shrub 1.5 m. high, overhanging west Escarpment, Tafelberg, *24674;* shrub to 2 m. high, infrequent, leaves subcoriaceous, Savanna II, Tafelberg, *24706;* shrub to 2 m. high, Savanna IV, Tafelberg, *26172.* Not otherwise known from Surinam. FRENCH GUIANA: Marowijne River, *Wachenheim 77* (P); Godebert, *Wachenheim 373* (P, U); without locality, *Martin s.n.* type, duplicate in L and P; *Poiteau s.n.* (K), mixed with *E. Poiteau* Berg. The species belongs, with the Jamaican *E. Marchiana* Griseb., the Guiana *E. latifolia* Aubl. (non aliis auct.), and a few others to a group of species with mostly large subtriplinerved leaves, relatively large, fasciculate, lateral flowers and oblong-ellipsoid fruits. The leaves are shortly obtusely acuminate, obtuse or rounded at the apex, more or less coriaceous, and rather variable in size.

EUGENIA PUNICIFOLIA (H. B. K.) DC. (XI 26). BRITISH GUIANA: occasional, shrub, leaves chartaceous, fruit scarlet, ovoid, from bush island on Kaieteur Savanna, *23196.* SURINAM: rare, shrub to 1 m. high, savanna, Zanderij I, *23725.* In several varieties from Cuba to Brazil.

EUGENIA TAPACUMENSIS Berg (XI 27). SURINAM: small tree, fruit black, Gran Dam Rapids, Saramacca River, *24014.* Guiana, east Peru, Martinique, St. Vincent.

EUGENIA FLAVESCENS DC. (XI 28). SURINAM: tree to 10 m. tall, 10 cm. diam., leaves bright green, swampy bush above village along Saramacca trail, Jacob kondre, *23877.* Guiana, Brazil, Bolivia.

EUGENIA SCHOMBURGKII Benth. (XI 32). BRITISH GUIANA: Rupununi River, *Schomburgk 703,* type (K, G-DEL, L); *F. D. 2060* (K). Kurupung, Upper Mazaruni River, *Leng 258* fr. Nov. (NY). SURINAM: tree 12 m. high, fruit yellow, turning black, along riverbanks from Campo Dungeoman to Toekoemoetoe Creek, Saramacca River, *24063.* Frequent in Surinam. The ovary, described by Berg in Linnaea **27**: 198 (1856) as 3-celled, was in all flowers dissected by me 2-celled.

EUGENIA sp., not matched. SURINAM: shrub 2 m. high, immature fruit red, wallaba forest and swamp, vicinity Base Camp, Tafelberg Creek, *24091.* The specimen bears fruits only and does not belong to any *Eugenia* species already known from Guiana.

EUGENIA sp., not matched. BRITISH GUIANA: rare, 14 m. tree, 18 cm. diam., fruit green, *Dicymbe* forest on lateritic soil, along Potaro River below Tukeit, *23509.* Probably allied to *Eugenia latifolia* Aubl., but the flowers not known.

PSIDIUM PARVIFLORUM Benth. var. **saramaccense** Amsh. var. nov. (XIII 8). A typo differt inflorescentia floribusque glabris.

TYPE: common, small shrub to 3 m. high, flowers white, Gran Dam, Saramacca River, *Maguire 24930* fl. Oct. The flowers are quite glabrous, even the calyx inside. In a form collected along the Coppenam River in

Surinam the calyx is sericeous inside, as in typical *Ps. parviflorum* Benth. It is possible that some species described from Brazil must also be regarded as varieties of the same species. Typical *Ps. parviflorum* Benth. seems to be restricted to British Guiana (Rupununi and Essequibo Rivers) and to the adjoining part of the Brazilian state of Amazonas (Rio Branco, *Ule 7713* [L]).

PSIDIUM OVATIFOLIUM Berg. var. **glabrum** Amsh. var nov. A typo differt inflorescentia glabra.

TYPE: lax shrub to 4 m. high, growing in water, basin of Rupununi River, Karenambo, British Guiana, lat. about 3° 45′ N., *A. C. Smith 2253*, (U, NY, K), distributed as *Psidium aromaticum* Aubl., Rupununi River, F. D. (*Anderson*) 686 (K).

A predominant plant in riverside thickets, associated with *Ps. parviflorum* Benth. In the Kew herbarium there are two specimens of *Ps. ovatifolium* Berg, one a densely pubescent form, collected by *Spruce* anno 1850, in the vicinity of Santarem, Prov. Pará, duplicate of the type, the other a more glabrate form, *Spruce 1032*, along the shores of the Tapajoz River, Pará.

CALYCOLPUS REVOLUTUS (Schauer) Berg. (XIV 1). SURINAM: shrub, flowers white, south savanna, vicinity Arawak village of Mata, *24973*. French Guiana and Surinam.

MELALEUCA LEUCODENDRON L. BRITISH GUIANA: 16 m. tree, 30 cm. diam., grey flaky bark, flowers white, fruit grey-brown, woody, introduced, vicinity Mazaruni Forest Station, *23563*. Native of tropical Asia and Australia.

MELASTOMACEAE[101]

Since my summary of the Melastomaceae of British Guiana, published in 1932, presented the results of about a century of botanical exploration in that colony, it is scarcely to be expected that the few years since elapsed would add much to the list of known species. Nevertheless, collections by Sandwith, Tutin, and Smith were all productive of a few undescribed species, and the recent expedition of Maguire has added a few more. It has been my privilege to examine the melastomes collected on this, the most recent expedition, and my identifications are given below. The sequence of genera is that adopted in my Synopsis (Brittonia **1**: 127–184. 1932) and page references are given to that paper.

TRIBE I. MICROLICIEAE

SIPHANTHERA JENMANI Gleason (137). BRITISH GUIANA: frequent, perennial herb, with leaves adpressed to stem, petals and stamens pink, sandy soil between low bush islands, Kaieteur Savanna, *23161*. Known only from the Kaieteur Plateau.

SIPHANTHERA CAPITATA Gleason (137). BRITISH GUIANA: rare, annual herb 10 cm. high, petals pink-mauve, anthers purple, on bare rock surface, Kaieteur Savanna, *23451; 23479*. Known only from the Kaieteur Plateau.

SIPHANTHERA HOSTMANNII Cogn. (139). SURINAM: shallow bogs, Savanna I, Tafelberg, *24222a*. Surinam; probably to be expected in British Guiana.

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[101] By H. A. Gleason.

TRIBE II. MERIANEAE

ADELOBOTRYS GUIANENSIS (DC.) Gleason (141). SURINAM: frequent, liana, petals flesh-colored, anthers and filaments white, processes yellow, leaves glossy green, subchartaceous, precipitous east-facing slopes above escarpment, 300 m. south of East Ridge, Tafelberg, *24557;* frequent, vine, leaves glossy green above, in medium bush, 1.5 km. south of East Ridge, Tafelberg, *24590.* The most abundant species in northern South America.

ADELOBOTRYS sp. SURINAM: frequent, vine, climbing, no fruiting or flowering material seen, high dakama forest, 0.5 km. south of East Ridge, Tafelberg, *24578.*

Adelobotrys laxiflora Triana was first collected "in Guiana Anglica ad flum. Essequibo" by C. F. Appun and his specimen is preserved in the herbarium at Kew. It exhibits four leaves and several inflorescences of post-mature fruit. Since then it has been collected at least five times, by Jenman, Linder, and Sandwith, and always only in fruit (Synopsis, 140, 141).

In comparison with other species of *Adelobotrys* it is quite anomalous. The leaves are alternate instead of opposite, with very little trace of the abortive member of the pair. Malpighian hairs are lacking. Pubescence of the stem is glandular, at least in part, instead of simple. The fruits are loosely paniculate instead of umbellate.

Maguire has at last discovered the plant in flower and has prepared excellent herbarium specimens which show still other features in which it differs from *Adelobotrys.* The calyx is calyptriform, instead of open in the bud. The stamens are almost isomorphic, instead of strongly dimorphic. The connective is expanded at base into a large, dark-colored, cordate organ, with a single dorsal and two ventral lobes, and completely lacks the long dorsal appendages of *Adelobotrys.* These numerous and important differences from *Adelobotrys* and all other described genera of the family warrant the erection of a new genus:

Phainantha Gleason, gen. nov. Hypanthium obconicum. Calyx calyptriformis ad torum deciduus. Flores 4-meri. Stamina fere isomorpha; antherae subulatae; connectivum crassum carnosum fuscum 3-lobum, lobo uno dorsali ad thecas adpresso, lobis duo ventralibus rotundatis. Ovarium superum 4-loculare. Folia alterna petiolata. Inflorescentia axillaris vel terminalis paniculiformis. Capsula elongata 4-locularis, calyce persistenti inclusa.

The tribe of the family to which *Phainantha* should be referred is still conjectural, since no mature seeds are available.

Phainantha laxiflora (Triana) Gleason, comb. nov. *Adelobotrys laxiflora* Triana, Trans. Linn. Soc. **28**: 68. 1871. The extant specific descriptions may now be supplemented by the characters of the flowers: hypanthium pink, obconic, about 6 mm. long, sparsely beset with spreading glandular hairs about 1 mm. long; petals pink, narrowly obovate, about 6 mm. long; filaments 2.1–2.4 or 1.7–1.8 mm. long, glabrous; anthers 2.2 or 1.5–1.8 mm. long. BRITISH GUIANA: occasional; climbing vine with fleshy red-nerved leaves, appressed to tree trunk; pubescence reddish; flowers pink, secondary forest, Waratuk Falls, Potaro River Gorge, *23033;* wallaba forest, Kaieteur Plateau, *23229.*

GRAFFENRIEDA OVALIFOLIA Naud. (142, under *G. Weddellii*). BRITISH GUIANA: rare, shrub or small tree to 4 m. tall, 8 cm. diameter, leaves leath-

ery, fruit urceolate, purple-brown, low bush island fringe, Kaieteur Savanna, *23183*. Hitherto known only from the vicinity of Mount Roraima, in northern Brazil and southern Venezuela.

GRAFFENRIEDA CARYOPHYLLAEA Triana. BRITISH GUIANA: occasional, shrub to 1.6 m. tall, stems quadrangular, leaves leathery, petals white, stamens yellow, margins of bush islands, Kaieteur Savanna, *23131*. Tentatively referred to this species, since the specimen is in fruiting condition only; new to British Guiana. Distinguished from the known species (142) by its coriaceous, short-petioled, 3-nerved leaves with the lateral nerves submarginal.

TRIBE III. BERTOLONIEAE

MACROCENTRUM CRISTATUM (DC.)Triana (145). BRITISH GUIANA: annual herb to 30 cm. high, leaves pale green, petals white, anthers crimson, rock surface, rare, trail Tukeit to Kaieteur Plateau, *23085;* locally common, damp rocks, Waratuk Portage, Potaro River Gorge, *23542*. Probably throughout the colony.

MACROCENTRUM VESTITUM Sandwith (145). BRITISH GUIANA: locally common, annual herb, to 8 cm. high, leaves hispid, outside half of petal crimson, filaments white, on rock surfaces, trail from Tukeit to Kaieteur Plateau, *23070;* flowers crimson, occasional, on moist rocks, Amatuk Portage, *23027*. Endemic to river and rapids habitats in British Guiana.

MACROCENTRUM DROSEROIDES Triana (145). BRITISH GUIANA: rare, annual herb to 5 cm. high, flowers crimson, fruit capsules brown, on moist rocks, trail from Tukeit to Kaieteur Plateau, *23082*. Endemic to river and rapids habitats in British Guiana.

MACROCENTRUM FASCICULATUM (L. C. Rich.) Triana (145). SURINAM: common, petals white flushed with pink, anthers yellow, under drips, high bush, base north escarpment, Tafelberg, *24342;* infrequent, leaves reddish-green above, purple-red beneath, petals pink, anthers yellowish, pink-tipped, on damp, shaded walls of gorge above Lisa Falls, Tafelberg, *24368;* frequent, leaves purple-red beneath, moist cliffs, south base Arrowhead Basin, Tafelberg, *24465;* frequent, east-facing slopes above escarpment, 300 m. south of East Ridge, Tafelberg, *24552;* petals pale pink, anthers pale yellow, foot Augustus Falls, base north escarpment, mixed high forest, Tafelberg, *24746*. A comparatively rare species from the Guianas; a varietal form has been described from Peru and the species probably occurs elsewhere in the Amazonian forests. No. *24552* has unusually large leaves. French Guiana, Peru, intervening territory.

MACROCENTRUM FRUTICOSUM Gleason. SURINAM: locally abundant petals pink, filaments white, anthers pale yellow, forming dense cover on and among wet boulders, base Grace Falls, Tafelberg, *24515*. Endemic.

This, the largest species of the genus, was described from three collections from the mountains of Surinam. Attention was directed at that time to certain variations in the leaves. The recent collections by Maguire add two other variations: the leaves are distinctly 3-nerved and the flowers are 5-merous. Nevertheless, the original collections agree so closely with this one in all small details of flower structure that I am confident that they should all be referred to the same species.

Macrocentrum parvulum Gleason, sp. nov. Herbacea. Caules radices emittentes, 1–2 cm. longi, interdum parce ramosi, glabri, internodiis ca. 2

mm. longis. Folia 6–10, in quoque jugo aequalia vel fere aequalia. Petioli usque ad 7 mm. longi, glabri. Laminae tenues, ovato-oblongae, rotundo-ovatae vel rhombo-ovatae, 1–2 cm. longae, 5–12 mm. latae, obtusae vel subacutae, conspicuiter serrulatae, basi abrupte angustatae, ciliatae, supra setosae, subtus glabrae rubrae, 3-nerviae. Pedunculi terminales, 15–30 mm. longi. Flores 2–4, secundi, 4-meri; pedicelli usque ad 4 mm. longi. Flores maturi desiderantur. Sepala ex alabastro semicircularia, apiculata; dentes exteriores minuti, patuli; petala lanceolato-triangularia; stamina *Macrocentri.*

TYPE: frequent, delicate annual, petals pale pink, anthers purple, drier places under cliffs, Arrowhead Basin, 625 m. altitude, Tafelberg, Surinam, August 23, 1944, *Maguire 24469.* New York Botanical Garden. SURINAM: infrequent, single open flower, pale pink, hypanthium 2.6 mm. long, petals 5 mm. long, anthers and processes purple, opening in high bush, base of north escarpment, Tafelberg, *24320.*

Apparently *M. parvulum* is more similar to *M. cristatum* (DC.) Triana than to any other known species, but differs in its short internodes, setose, conspicuously serrulate leaves, and few flowers.

Macrocentrum montanum Gleason sp. nov. Herba verisimiliter annua, 5–10 cm. alta, caule glabro anguste 2-alato. Petioli 5–8 mm. longi. Laminae isomorphae, ovatae, usque ad 14 mm. longae 12 mm. latae, obtusae, spinuloso-serrulatae, basi rotundatae, supra sparsissime pilosae, pilis 0.4 mm. longis, subtus glabrae albo-punctatae. Flores 4-meri in racemis 2–4-floris, pedicellis glabris ca. 2 mm. longis. Hypanthium obconicum, 4.4 mm. longum, conspicuiter 8-costatum. Calycis tubus ca. 0.4 mm. longus, lobi late triangulares, acuti, 1.2 mm. longi, dentibus exterioribus nullis. Petala oblongo-oblanceolata, erecta, acuta, 5 mm. longa. Stamina 8, isomorpha; filamenta gracillima, 2.6 mm. longa; antherae subulatae, 2.7 mm. longae, poro terminali dehiscentes; connectivum infra thecas brevissime productum; calcar 2 mm. longum, sursum curvatum.

TYPE: rocky stream-bank at the foot of the Tafelberg, Surinam, *Maguire 24189.* New York Botanical Garden. Among the 4-merous members of the genus, our species is distinguished by its small size and few flowers from *M. fruticosum,* by its well developed calyx-lobes, narrow erect petals, and erect spur from *M. cristatum,* and from *M. parvulum* by its well developed internodes, green ciliate leaves, and the lack of exterior teeth on the calyx.

Diolena repens Gleason, sp. nov. Herba basi in muscis repens superne pendens, caulibus glabris 1–2 cm. longis. Folia valde dimorpha; majora elliptica 8–14 mm. longa, 3–6 mm. lata, patula, acuta, supra medium dentibus spinulosis 3–6 ornata, 3-nervia, venis secundariis obsoletis, utrinque glabra, petiolo 0.5–1 mm. longo; minora ovata 2–3 mm. longa 1-nervia, petiolo 0.2 mm. longo. Pedunculus solitarius terminalis 1-florus 2–5 mm. longus, breviter squamoso-pubescens. Hypanthium maturum poculiforme 2.2 mm. longum, squamoso-pubescens. Calycis tubus 0.5 mm. longus, lobi depresso-ovati purpurei adscendentes 1.5 mm. longi, margine spinuloso-eroso, dentibus exterioribus subulatis lobos 0.4 mm. excedentibus. Petala staminaque desunt. Ovarium superum 3-loculare. Fructus capsularis in hypanthio inclusus. Semina pyramidata 0.4 mm. longa.

TYPE: flowering stems pendent, calyx-lobes faintly purple, vertical moist

walls of Potaro River Gorge, 1 mile below Kaieteur Falls, British Guiana, May 13, 1944, *Maguire & Fanshawe 23426*. New York Botanical Garden.

Enough of the ovary has been seen to assign the plant definitely to the tribe Bertolonieae. Its dimorphic leaves are so suggestive of *Diolena pileoides* Triana that it has been assigned to that genus, although the actual diagnostic character lies in the stamens which are as yet unknown. Our species differs from other species of *Diolena* in its 1-flowered peduncles.

Diolena is primarily a genus of northwestern South America, including several species with large leaves in the lowlands of the upper Amazon and in Colombia and Peru, with others as far north as Guatemala. *D. pileoides* and its close relative *D. agrimonioides* are confined, so far as known, to the western side of the main range of the Andes. *D. repens* extends the known range of the genus about a thousand miles to the eastward.

The genus is distinguished from *Salpinga* and *Macrocentrum*, the only other members of the tribe in British Guiana, by the development of two slender spurs on the anther.

TRIBE IV. TIBOUCHINEAE

APPENDICULARIA THYMIFOLIA (Bonpl.) DC. (146). BRITISH GUIANA: rare, annual herb to 30 cm. high, pubescence glandular, flowers pink, crevices on bare rock surface, Kaieteur Savanna, *23452*. SURINAM: frequent, herbage red, petals pink-lavender, anthers greenish-yellow, processes purple, filaments white, shallow bogs, Savanna I, Tafelberg, *24207*. A rare little plant, hitherto known only from French Guiana and in British Guiana by a collection of *Jenman*, also from the Kaieteur Savanna.

The genus resembles *Ernestia* in its glabrous ovary and slender elongate anther-appendages; it differs in the sepals, which are nearly semicircular and broader than long.

ERNESTIA PULLEI Gleason. SURINAM: common annual, petals and anthers purple, filaments and appendages white, open sandy soil, islands in Brokoboto Rapids, 3 hours above Pakka Pakka, Saramacca River, *23992*. Endemic.

Ernestia minor Gleason, sp. nov. Caules debiles elongati, usque ad 6 cm. longi, rubri, dense minuteque pubescentes pilis glandulosis ca. 0.2 mm. longis. Petioli rubri, 5–8 mm longi, sicut caulis pubescentes. Laminae ovatae, usque ad 35 mm. longae 25 mm. latae, abrupte acuminatae, basi cordatae, minute denticulatae, ciliatae, 5-nerviae, utrinque minutissime denseque pubescentes pilis ca. 0.1 mm. longis. Inflorescentia terminalis, cymosa, pauciflora, 3–5 cm. longa, sicut caulis pubescens. Hypanthium tubulosum, 3 mm. longum, dense glanduloso-puberulum. Sepala lineari-lanceolata, 2.8 mm. longa, obtusa sicut hypanthium pubescentia. Stamina fere isomorpha; filamenta 4.1 vel 3.8 mm. longa; thecae subulatae rectae, 3.6 vel 3 mm. longae; connectivum incurvatum, 0.8 vel 0.5 mm. longum, in ser. ext. tuberculo dorsali ornatum; calcaria subulata erecta, 1.1 vel 0.9 mm. longa. Ovarium glabrum.

TYPE: locally frequent, petals pink, stamens white, climbing against wet walls of Grace Falls, Arrowhead Basin, 625 m. altitude, Tafelberg, Surinam, August 26, 1944, *Maguire 24514*. New York Botanical Garden. SURINAM: frequent, petals pale pink, anthers purple, under spray, base north escarpment, Tafelberg, *24322*.

Apparently only four of the described species of *Ernestia* have a glabrous ovary. *E. cordifolia* is a plant of western Venezuela with large setose leaves. *E. glandulosa* Gl., of British Guiana, has setose leaves and axillary inflorescence, but isomorphic stamens like *E. minor*. *E. Pullei* Gl., of Surinam, has strongly dimorphic stamens and short, broadly triangular sepals. *E. rubra* Pulle, also of Surinam, has leaves acute at base and short broad sepals.

ACIOTIS DYSOPHYLLA (Benth.) Triana (149). BRITISH GUIANA: locally frequent, herbaceous annual, with 4-angled stems, petals pink, anthers pale mauve, Tukeit, Potaro River Gorge, *23046*. Widely distributed in tropical South America.

ACIOTIS DICHOTOMA (Benth.) Cogn. (149). BRITISH GUIANA: low herb, flowers pink, Mazaruni Station, Mazaruni River, *M6*. Surinam, Trinidad, Venezuela.

ACIOTIS ORNATA (Miq.) Gleason (149). BRITISH GUIANA: Takutu Creek to Puruni Road, Mazaruni River, *F2073;* Yarikita Portage, N.W.D., *F2443*. Surinam.

ACIOTIS LAXA (L. C. Rich.) Cogn. (149). BRITISH GUIANA: occasional to frequent, subshrub to 2 m. high, flowers white, in *Mora* forest, Kamuni Creek, Groete Creek, Essequibo River, *22812;* Garraway Stream, Potaro River, *22979;* east side Ikuruwa Lake, Canje River, *F.D. 657*. SURINAM: frequent, petals white, pink-tipped, anthers pink, pubescent leaf-margins pink, in mixed high forest, dripping rocks, in spray at base north escarpment, Tafelberg, *24761;* flowers white, high mixed forest, south rocky slopes Arrowhead Basin, Tafelberg, *24610;* annual, petals pale pink, pubescence red, anthers deep pink, filaments white, savanna, Zanderij II, *25037;* annual, petals and filaments white, anthers purple-pink, savanna, east side, Zanderij I *25046*. An abundant and widely distributed Amazonian species.

ACIOTIS PURPURASCENS (Aubl.) Triana (149). SURINAM: frequent, annual, petals white, anthers pink, thickets, low bush bordered by *Montrichardia arborescens*, lower Saramacca River, vicinity Tawa Creek, *23739;* frequent, annual, petals white, anthers pink, openings, wallaba forest, Base Camp (1), Tafelberg Creek, Saramacca River Headwaters, *24108;* infrequent, annual, flowers white, high mixed wallaba forest, south base Table Mountain, *24827;* flowers pink, km. 68, vicinity Sectie O, *25002*. An abundant and widely distributed Amazonian species. The Guianas, Amazonian Brazil and Peru.

NEPSERA AQUATICA (Aubl.) Naud. (150). SURINAM: petals white, anthers purple, along railroad, near km. 70, *23633;* annual, petals white, stamens purple, opening south Savanna IV, Tafelberg, *24387;* infrequent, petals white, stamens purple, moist shaded rocky areas, 3 km. southeast Savanna I, Tafelberg, *24414*. Very abundant in northern South America, especially in open waste places.

COMOLIA VERNICOSA (Benth.) Triana (151). BRITISH GUIANA: infrequent, shrub to 1 m. high, leaves brittle, leathery, glaucous beneath, young fruit yellow-brown, in crevices bed rock, Kaieteur Savanna, *23101;* savanna, Demerara River, *F.D. 504*. SURINAM: shrub to 80 cm. high, flowers purple, grass savanna, Zanderij II, *23655*. British Guiana and Surinam.

COMOLIA LYTHRARIOIDES (Steud.) Naud. (151). BRITISH GUIANA: occasional, perennial suffrutescent herb to 60 cm. high, petals and anthers pink,

filaments white, in crevices bed rock, Kaieteur Savanna, *23120;* Karakara Savanna, *F.D. 540.* SURINAM: subshrub to 50 cm. high, flowers pink, grass savanna, Zanderij II, *23701;* frequent, flowers and stamens pink, wet sand, savanna, Zanderij I, *23736.* Known from British Guiana, Surinam, and Trinidad.

COMOLIA VILLOSA (Aubl.) Triana (151). SURINAM: high bush, base north escarpment, Tafelberg, *24321a;* infrequent, flowers whitish, anthers flushed with pink, low bush, Savanna II, Tafelberg, *24231.* Apparently the first report from Surinam, although previously known from French and British Guiana, extending west to Venezuela. The species is distinguished from *C. purpurea* by its glandular pubescence; from *C. veronicaefolia* by its petiole a third to half as long as the blade and the blades rounded at base.

COMOLIA VERONICAEFOLIA Benth. (151). SURINAM: frequent, subshrub to 0.5 m. high, flowers light purple, anthers purple, sandbanks along railroad bed, Kwakoegron, *23778.* Northern Brazil to Trinidad.

COMOLIA ANGUSTIFOLIA Gleason (151). BRITISH GUIANA: occasional, annual tufted herb to 30 cm. high, petals pale mauve, on white sand in secondary forest, Amatuk Portage, Potaro River Gorge, *23022.* Kaieteur Savanna, endemic.

ACISANTHERA TETRAPTERA (Cogn.) Gleason. SURINAM: flowers purple, Zanderij II, *25033.* Endemic and rarely collected.

TIBOUCHINA ASPERA Aubl. (155). SURINAM: shrub to 1 m. high, flowers purple-rose, grass savanna, Zanderij II, *23656;* frequent, subshrub to 0.5 m. high, flowers light purple, anthers white, sandbanks along railroad bed, Kwakoegron, *23777.* Widely distributed in South America, especially in savannas.

PTEROLEPIS GLOMERATA (Rottb.) Miq. (157). SURINAM: petals white, anthers purple, processes yellow, km. 68, vicinity Sectie O, *24988;* annual, petals white, anthers purplish, processes yellow, grass-sedge savannas, Zanderij II, *25038.* A common weedy species of wide distribution in South America and the West Indies.

MACAIREA ASPERA N. E. Brown (158). BRITISH GUIANA: common, shrub of lax growth to 2 m. high, stems quadrangular, pubescence bronze-brown, petals white, suffused with pink beneath, stamens yellow, dominant shrub of bush islands, Kaieteur Savanna, *23110.* Endemic, known only on Roraima and the Kaieteur Plateau.

MACAIREA PACHYPHYLLA Benth. (158). BRITISH GUIANA: common, lax, open-crowned, rounded shrub, leaves bullate, Kaieteur Savanna *23342.* SURINAM: tree 10 m. tall, 10 cm. diameter, leaves glutinous, petals pink-purple, anthers greenish-yellow, filaments purplish, low wet bush, 1.5 km. south of Savanna I, Tafelberg, *24350;* infrequent shrub or small tree to 8 m., flowers deep pink, Savanna IV, Tafelberg, *24793.* Hitherto known only from the plateaus adjacent to Mount Roraima.

The genus is best developed in the Pacaraima Mountains and a few species extend east to the Kaieteur Plateau. In the key to the genera of Tibouchineae in the Flora of Surinam, it would be referred to *Tibouchina* or *Pterolepis.* It differs from the Surinam representatives of these genera in the pubescence of the hypanthium, which includes neither branched hairs nor flat scales.

DESMOCELIS VILLOSA (Aubl.) Naud. (158). SURINAM: annual, petals pink, stamens pale, grass-sedge savanna, Zanderij II, *25040*. A widely distributed weedy plant extending south to southern Brazil.

TRIBE VII. MICONIEAE

BELLUCIA GROSSULARIOIDES (L.) Triana (160). SURINAM: tree 18 m. tall, 40 cm. diameter, flowers white, fruit yellowish, edible, tree non-buttressed, rear of village, Pakka Pakka, Saramacca River, *23968;* occasional, tree to 5 m. high, 7 cm. diameter, flowers pink in bud, edge of forest, sandbanks along railroad bed, Kwakoegron, *23785*. Widely distributed through northern South America, extending also north into Central America.

LOREYA MESPILOIDES Miq. (161). BRITISH GUIANA: low tree to 4 m. high, 3 cm. diameter, cauliflorous, leaves rough, rocky lateritic soil, Garraway Stream, Potaro River, *22967*. Probably throughout forested region of British Guiana; Surinam, French Guiana; reported from Peru.

HENRIETTELLA CAUDATA Gleason. BRITISH GUIANA: infrequent small tree to 5 m. tall, 4 cm. diameter, cauliflorous, flowers greenish, fruit bright red, mixed forest, Kamuni Creek, Groete Creek, Essequibo Creek, *22907*. SURINAM: rare, base talus, north slopes, Tafelberg, mixed forest, *25067;* infrequent, small tree, fruit red, mixed high wallaba forest, km. 25, south base Tafelberg, *24821*. British Guiana and Surinam. Known to me hitherto only from the type collection in Surinam.

It may be distinguished from *H. verrucosa* by its glabrous leaves and from *H. flavescens* by its narrow, caudate-acuminate leaves.

Henriettella venosa Gleason, sp. nov. Rami juveniles densissime fulvo-pubescentes mox glabrescentes. Petioli 2–5 cm. longi sicut rami pubescentes. Laminae ovatae usque ad 18 cm. longae 9 cm. latae, acuminatae, basi cuneatae, insigniter 5–7-pli-nerviae, supra glabrae, subtus ad paginam glabrae ad venas venulasque furfuraceae. Flores 4-meri sessiles, pauci in fasciculo ad axillas foliorum delapsorum. Hypanthium campanulatum 2 mm. longum; sepala lata triangularia, a sinibus 0.3 mm. longa; dentes exteriores crasse subulati, patuli, valde recurvi, circa 1.5 mm. longi. Petala triangularia acuta, ca. 2 mm. longa. Stamina 8 isomorpha; filamenta nondum evoluta; antherae lineares 1.7 mm. longae, poro dorso-terminali dehiscentes.

TYPE: occasional, shrub to 3 m. high, cauliflorous, *Mora* and mixed forest, Kamuni Creek, Groete Creek, Essequibo River, British Guiana, April 14, 1944, *Maguire & Fanshawe, 22833*. New York Botanical Garden.

About 40 species of *Henriettella* have been described. Several of them have strongly pli-nerved leaves, like our species, but among them are none which combine the characters of sessile 4-merous flowers and large exterior teeth.

HENRIETTEA MULTIFLORA Naud. (162). BRITISH GUIANA: occasional to frequent, small tree to 4 m. high, 3 cm. diameter, cauliflorous, petals and filaments white, anthers purple, on white sand, secondary forest, Waratuk Falls, Potaro River Gorge, *23041*. Forested regions, French Guiana to Trinidad.

HENRIETTEA MARONIENSIS Sagot. SURINAM: shrub 3 m. tall, savanna, east side, Zanderij I, *25047*. Hitherto known only from French Guiana. It has a hairy style, as does *H. succosa* (Aubl.) DC., and is separated from that species by the very long hairs of the hypanthium.

HENRIETTEA SUCCOSA (Aubl.) DC. (162). BRITISH GUIANA: frequent, tree to 12 m. tall, 10 cm. diameter, fruit urceolate, 10–12 mm. long, 10–12 mm. broad, sweet, edible, openings in high forest, Kamuni Creek, Groete Creek, Essequibo River, *22882*. Probably throughout forested regions, central Brazil to Panama and Trinidad.

HENRIETTEA RAMIFLORA (Sw.) DC. (162). BRITISH GUIANA: common, tree 6–8 m. tall, 10 cm. diameter, veins and sometimes leaves suffused red on lower surface, cauliflorous, petals pink, anthers blue, filaments pale pink, ripe fruit brown-purple, edible, bush islands on Kaieteur Savanna, *23126*. Surinam to Jamaica.

LEANDRA PURPUREA Gleason (163). BRITISH GUIANA: subshrub to 1.6 m. high, flowers white, fruit magenta-purple, rocky lateritic soil from dolerite dyke, roadside, Garraway Stream, Potaro River, *22986;* dense forests vicinity Bartica, Moraballi Creek, *F1289*. Endemic.

LEANDRA RUFESCENS (DC.) Cogn. (164). BRITISH GUIANA: frequent, shrub to 2 m. high, *Mora* forests, Kamuni Creek, Groete Creek, Essequibo River, *22814;* Camana Road, *Aitkin A42*. SURINAM: shrub to 3 m. high, stems velvety, tawny to base, swamps in primary jungle, near Posoegronoe, 24045. Kaieteur Falls; eastern Brazil to Venezuela and Trinidad.

LEANDRA MICROPETALA (Naud.) Cogn. BRITISH GUIANA: occasional to frequent, lax-branched shrub to 1.5 m. high, flowers white, calyx lobes green, young fruit pink-red, from *Dicymbe* forest, on white sand, trail Tukeit to Kaieteur Plateau, *23064*.

New to British Guiana. The specimens lack flowers, but the foliage and pubescence indicate the species. It is distinguished from *L. rufescens*, to which it would be referred through the key in the Synopsis, by the spreading pubescence of the stem and the permanently setose upper surface of the leaves.

LEANDRA SOLENIFERA (Schrank) DC. (164). BRITISH GUIANA: rare to occasional, subshrub to 45 cm. high, strongly stoloniferous, inflorescence scorpoid, green, petals white, anthers pink, on white sand, clearing at forest edge, Tukeit, Potaro River, *23042*. SURINAM: frequent, shrub to 2 m. high, petals and filaments pale pink, anthers white, swampy bush above Jacob kondre, along Saramacca River, *23871*. Widely distributed but apparently never abundant in the Amazonian forests. Upper Mazaruni River, French Guiana and Amazon Valley.

LEANDRA DIVARICATA (Naud.) Cogn. (164). BRITISH GUIANA: probably perennial, stoloniferous, rooting at nodes, floor of openings, damp soil, *Mora* and mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22918*. SURINAM: common, fruit purple, openings in montane forest, line between Kwatta (3) and Pakira (4) Camps, Coppenam River Headwaters, *24162;* montane forest, vicinity Krappa Camp (2), *24146a*. Abundant in lowland forests in the three Guianas. Lowlands from French Guiana to Venezuela; reported from upper Amazon Valley.

LEANDRA LONGICOMA Cogn. (164). BRITISH GUIANA: occasional, shrub 1.3 m. high, lax-branched, inflorescence hairy, brown to crimson, pubescence velvety, petals pink to red, stamens yellow, on white sand, clearing at forest edge, Tukeit, Potaro River Gorge, *23045*. Also in Amazonian Peru, where it is abundant.

LEANDRA SANGUINEA Gleason. The type material, collected by Sandwith

on the Kaieteur Plateau, was in fruit. Flowering material collected by Maguire enables me to issue the following supplemental description:

Hypanthium cup-shaped, 2.8 mm. long, densely strigose with erect hairs up to 2 mm. long; sepals 0.5 mm. long from the torus, depressed-ovate; exterior teeth totally adnate, linear, projecting 1.6 mm. beyond the sepals, hirsute like the hypanthium; petals narrowly triangular, acute, 2.3 mm. long; stamens isomorphic; filaments 3 mm. long; anthers linear, obtuse, 1.4 mm. long, opening by a ventral pore; connective neither appendaged nor prolonged; ovary 3-celled, half-inferior, its conic summit 10-toothed, each tooth bearing a minute terminal glandular bristle. BRITISH GUIANA: frequent, shrub to 2 m. high, lax growth, inflorescence with pink hairs, petals white, stamens yellow, rocky places, mixed montane high forest, trail Tukeit to Kaieteur Plateau, *23075*.

OSSAEA DUCKEANA Hoehne. BRITISH GUIANA: rare, vine from low tree, attached by short rootlets to tree, fruit 10×8 mm., blue, fleshy, Kaieteur Savanna, *23228*. The specimen agrees in every way with Hoehne's careful description, plate, and dissections. It represents a new genus for British Guiana and is possibly the second collection of the species.

The genus *Ossaea* is distinguished from *Clidemia* by its acute petals and from *Leandra* by its axillary flower clusters.

CLIDEMIA CAPITATA Benth. (166). BRITISH GUIANA: frequent, lax shrub to 2 m. high, flowers white, in bracteate heads, fruit 1.5×1 cm. oblong-globose, deep blue, bush islands, Kaieteur Savanna, *23130*. Otherwise known from the Roraima region.

CLIDEMIA RUBRA (Aubl.) Mart. (166). BRITISH GUIANA: subshrub to 1 m. high, petals pink, fruit globose, purple, on rocky lateritic soil, at edge of clearing, Garraway Stream, Potaro River, *22953*. SURINAM: perennial, petals whitish, anthers bright purple-red, pubescence stramineous becoming brown, grass-sedge savanna, Zanderij II, *25039*. Common almost throughout tropical America.

CLIDEMIA APHANANTHA (Naud.) Sagot. BRITISH GUIANA: frequent, subshrub to 1.3 m. high, leaves purple-tinged below, petals white, fruit purple, on rocky lateritic soil from dolerite dyke, Garraway Stream, Potaro River, *22978;* Mazaruni Station, Mazaruni River, *F1386*. Included under *C. rubra* in the Synopsis, and weakly distinguished from it by the presence of petioles 2–5 cm. long.

CLIDEMIA JAPURENSIS DC. (166). SURINAM: locally common, shrub to 2 m. high, herbage glutinous, petals white, anthers yellowish, fruit 12 mm. long, pale blue, openings in low bush, 1 km. south Savanna I, Tafelberg, *24348*. Widely distributed in the Amazonian forests, British Guiana, Surinam, and Amazon Valley.

CLIDEMIA MINUTIFLORA (Triana) Cogn. (166). BRITISH GUIANA: locally frequent, subshrub to 1 m. high, flowers axillary, white, red loam, rocky ground, trail from Tukeit to Kaiateur Falls, *23068*. SURINAM: subshrub to 5 m. high, opening in high bush, base north escarpment, Tafelberg, *24317;* frequent, subshrub to 1 m., petals white, anthers pale yellow, dense shade, overhanging East Ridge Gorge, high forest, Tafelberg, *24532*. Upper Mazaruni River, also upper Rio Negro. Recognized by its dimorphic leaves essentially glabrous above and glandular-hirsute hypanthium.

CLIDEMIA TILIAEFOLIA DC. (166). SURINAM: frequent, open slender

shrub to 3 m., flowers and anthers white, bush to rear of Jacob kondre, Saramacca River, *23755*. A species of the Amazonian forests.

CLIDEMIA HIRTA (L.) D. Don. (166). BRITISH GUIANA: frequent, weak shrub to 1 m. high, flowers white, fruit globose, blue-black, high mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22840;* rocky lateritic soil, clearing edge, Garraway Stream, Potaro River, *22960*. SURINAM: frequent, subshrub 1 m. high, flowers and stamens white, along railroad near km. 70, *23631;* frequent subshrub to 1.5 m. high, fruit blue, thickets, low bush bordered by *Montrichardia arborescens,* lower Saramacca River, vicinity Tawa Creek, *23738;* frequent, annual to 0.5 m., flowers and anthers white, fruit blue, about clearings, Jacob kondre, bush to rear of village, Saramacca River, *23754*. Common and widely distributed almost throughout tropical America.

CLIDEMIA INVOLUCRATA DC. (167). BRITISH GUIANA: occasional, woody shrub to 2 m. high, inflorescence of three flowers, red-purple, fruit pale china blue, pithy, river bank between Kangaruma and Amatuk, Potaro River, *23010*. Upper Demerara River, lower Essequibo River; French Guiana to Trinidad.

CLIDEMIA SILVICOLA Gleason. BRITISH GUIANA: occasional to frequent, tall perennial herb to 1 m. high, flowers white, fruit purple, roadside, Garraway Stream, Potaro River, *22985*. Hitherto known only from the type collection of *A. C. Smith*, British Guiana.

Through the key in the Synopsis this would be referred to *C. coriacea*. Our plant is pubescent with simple hairs, while the pubescence of *C. coriacea* is stellate.

CLIDEMIA PYCNASTER Tutin. BRITISH GUIANA: locally frequent, subshrub 60 cm. high, inflorescence brown, petals white with pink center, filaments pink, anthers white, Kaieteur Savanna, *23311*. SURINAM: frequent slender branched shrub to 1.5 m., petals pale lavender, anthers purple, processes and filaments white, Savanna II, Tafelberg, *24230;* rare, petals pink on midrib and base, stamens whitish, glands purple, border low bush, Savanna IV, *24389;* shrub to 1.5 m., Savanna IX, Tafelberg, *24653*. Hitherto known only from the Kaieteur region of British Guiana.

This species has 4-merous flowers also, and may be distinguished from the other Surinam species by its close stellate-tomentose indument.

CLIDEMIA SEPTUPLINERVIA Cogn. BRITISH GUIANA: cauliflorous, hypanthium pale green, calyx and teeth long, revolute, petals white, ovate, patent, stamens white, fruit globose, china blue, seeds numerous, dark brown, Groete Creek, Essequibo River, *F1720*. Peru, Ecuador, Colombia, Jamaica.

CLIDEMIA UMBONATA DC. (167). BRITISH GUIANA: occasional, shrub to 3 m. high, lax growth, flowers translucent white, young fruit crimson, ripe fruit black, Kaieteur Savanna, *23247;* Mazaruni Station, Mazaruni River, *M351*. Common throughout colony; Amazon Valley to Caribbean Sea.

CLIDEMIA STRIGILLOSA (Sw.) DC. (167). BRITISH GUIANA: rare, shrub of lax growth to 1.3 m. high, pubescence reddish, petals white, Kaieteur Plateau, *23103*. SURINAM: petals pale green, anthers rose, savanna, vicinity Sectie O, *25017;* openings low bush, 1 km. south of Savanna I, Tafelberg, *24348a*. Widely distributed in tropical America.

24348a varies from typical *C. strigillosa* in a number of small differences, but not sufficiently to interpret the collection as a new species.

CLIDEMIA CONGLOMERATA DC. (167). BRITISH GUIANA: frequent shrub to 4 m. high, *Mora* forests, Kamuni Creek, Groete Creek, Essequibo River, *22808;* subshrub to 1 m. high, flowers white, fruit globose-oblong, blue, rocky lateritic soil, clearing edge, Garraway Stream, Potaro River, *22954* French Guiana to Trinidad.

CLIDEMIA sp. BRITISH GUIANA: subshrub to 1 m. high, flowers white, fruit blue-black, on rocky lateritic soil, clearing edge, Garraway Stream, *22958.* While the pedunculate inflorescence with a single central axis shows its affinity with *C. umbonata* and allies, it cannot be referred satisfactorily to a species.

MAIETA POEPPIGII Mart. (168). BRITISH GUIANA: rare, lax-branched subshrub 0.6–1.3 m. high, hairy, hypanthium yellow, fruit glossy black, from red loam on rocky ground, *Dicymbe* forest, Tukeit to Kaieteur Falls, *23060; 23069.* Kangaruma; also throughout Amazon Valley and in Cocos Island.

TOCOCA ARISTATA Benth. (169). BRITISH GUIANA: occasional, shrub to 2 m. high, swollen petioles inhabited by ants, flowers pale yellow, filaments pale yellow, anthers pink, secondary forest, on white sand, Waratuk Falls, Potaro River Gorge, *23034;* Tukeit to Kaieteur, *23063.* Widely distributed throughout colony; French Guiana to upper Amazon Valley.

TOCOCA NITENS (Benth.) Triana (170). BRITISH GUIANA: occasional shrub, 1–1.6 m. high, leaves leathery, thick, petals pink shading to white on margins, anthers white, filaments pink, fruit oblong, blue-black, Kaieteur Savanna, *23177.* Also in southern Venezuela and adjacent Brazil.

TOCOCA DESILIENS Gleason. BRITISH GUIANA: rare, shrub to 4 m. high, 2–3 cm. diameter, open-crowned, petals part pink, part white, calyx truncate, anthers white, filaments pink, from *Terminalia* forest, Kaieteur Savanna, *23293.* Hitherto known only by the tyye collection, *Sandwith 1426;* endemic to British Guiana.

The species is characterized by glabrous style and absence of formicaria. It is separated from three other species with the same character by the long glandular hairs of the hypanthium.

MICONIA ACINODENDRON (L.) Sweet. SURINAM: frequent subshrub to 2 m., flowers white, low bush bordered by *Montrichardia arborescens,* lower Saramacca River, vicinity Tawa Creek, *23745.* Known also from British Guiana and the West Indies.

MICONIA RACEMOSA (Aubl.) DC. (177). BRITISH GUIANA: shrub to 2 m. high, flowers greenish-white, fruit oblong, purple-black, rocky lateritic soil, roadside and clearing edge, Garraway Stream, Potaro River, *22955.* SURINAM: shrub to 3 m., flowers purple, Kwakoegron, *25007.* Widely distributed; West Indies, in South America south to Rio de Janerio.

MICONIA CILIATA (Rich.) DC. (177). BRITISH GUIANA: occasional, shrub to 2 m. high, glabrous, leaves leathery, inflorescence scorpioid, petals pink basally, white apically, anthers purple, fruit black, in white sand, Kaieteur Plateau, *23105.* SURINAM: shrub to 3 m., flowers pink, savanna, Zanderij II, *23658;* frequent, shrub to 2 m., leaves subcoriaceous, dark glossy green, petals deep purple at base, light at tip, low bush, north Savanna III, Tafelberg, *24287;* flowers purple, south savannas, vicinity Arawak village Mata, *24983.* Widely distributed; tropical America, from central Brazil and Peru to Mexico and the West Indies.

MICONIA VIRGULATA Gleason (177). BRITISH GUIANA: occasional, shrub strict, to 2 m. high, leaves glossy, flowers pink-purple and small, fruit 3–4 mm. diameter, globose, blue-black, white sand, secondary forest species, Waratuk Falls, Potaro River Gorge, *23038*. Endemic to British Guiana.

MICONIA MYRIANTHA Benth. (178). BRITISH GUIANA: occasional, tree 6 m. tall, 3 cm. diameter, leaves glaucous below, fruit globose, reddish, secondary wallaba bush, Kaieteur Savanna, *23227*. Common throughout British Guiana.

MICONIA MARGINATA Triana (178). BRITISH GUIANAS locally common, shrub, lax growth, leathery leaves supple, flowers spicate, white, Kaieteur Savanna, *23231;* frequent shrub to 1.6 m. high, open growth, leaves leathery, flowers and stamens greenish-white, high mixed forest, Tukeit, *23537;* abundant in damp places, wallaba forest, 107 mile, Bartica-Potaro Road, *F1444*. The Upper Amazon Valley; known in British Guiana otherwise only from Tumatumari.

MICONIA CHRYSOPHYLLA (Rich.) Urban (177). BRITISH GUIANA: undergrowth tree 25 feet tall, 2 inches diameter, leaves buff to brown below, flowers white, minute, young fruit pale mealy green, opening in Greenheart forest, Siba Creek, *F689*. In forested region; Bolivia to Puerto Rico.

MICONIA GRATISSIMA Benth. (178). BRITISH GUIANA: occasional, tree to 5 m. high, 8 cm. diameter, undersurface of leaves tawny-tomentose, hypanthium green, flushed reddish, secondary forest species in white sand, Waratuk Falls, Potaro River Gorge, *23037*. Upper Amazon Valley.

MICONIA DODECANDRA (Desr.) Cogn. (178). SURINAM: tree to 10 m. tall, 10 cm. diameter, trunk 4-lobed, leaves tan beneath, petioles and ribs tawny, petals white, pink at base, stamens yellow, filaments turning orange-red in age, hence, flowers of two striking colors in inflorescence, s.e. margins Arrowhead Basin, Tafelberg, *24415;* frequent, tree 10 m. tall, 15 cm. diameter, petals white, stamens yellow, anthers turning red, high bush, south cliffs Arrowhead Basin, Tafelberg, *24457*. A widely distributed species in tropical America, but hitherto not reported from Surinam.

M. dodecandra resembles the well known *M. guianensis* (Aubl.) Cogn. in general appearance and is easily distinguished from that species by its permanently white-tomentose hypanthium.

MICONIA LONGIFOLIA (Aubl.) DC. (178). SURINAM: frequent, shrub 3 m. high, leaves bright green, fruit red turning blue-black, Jacob kondre, below rapids, Saramacca River, *23844*. Widely distributed from West Indies to Bolivia.

MICONIA PUBIPETALA Miq. SURINAM: small tree 4 m. tall, leaves green above, pink-tan beneath, shoots same color, petals white, pink-flushed, yellowish at base, stamens bright yellow turning red in age, inner surface of calyx red, young fruit red, river banks to Toekoemoetoe Creek, Saramacca River, *24061*. Abundant in the Guianas and Trinidad.

MICONIA SERRULATA (DC.) Naud. SURINAM: small tree to 4 m., petals and filaments white, anthers deep purple, along railroad near km. 70, *23641;* frequent, leaves pink-tan beneath; twigs green-tawny, Jacob kondre, below rapids, Saramacca River, *23843*. Abundant from Mexico and the West Indies to southern Brazil.

MICONIA DIAPHANEA Gleason. SURINAM: frequent, shrub 4 m. high, petals white, anthers yellow, montane forest, along stream-course, line be-

yond Pakira Camp (4), Coppenam River Headwaters, *24163;* infrequent, shrub to 4 m., fruit blue-black, base north escarpment, Tafelberg, *24777.* Endemic.

MICONIA DISPARILIS (Standl.) Williams. BRITISH GUIANA: shrub to 3 m. high in *Mora* bush, Kamuni Creek, Groete Creek, Essequibo River, *22813; F1983.* SURINAM: shrub to 3 m., twigs red, leaves bright glossy green, red-veined beneath, petals and anthers white, openings in wallaba forest, vicinity Base Camp (1), Saramacca River Headwaters, Tafelberg Creek, *24109.* Known also from scattered localities west to Central America; British Guiana, Trinidad.

The species is still poorly known and of remarkably disjunct distribution. Through the key in the Synopsis, it would be referred to the group including species 13–17. It differs from all of these in its 4-merous flowers.

MICONIA ERIODONTA DC. SURINAM: frequent small tree to 4 or 5 m. high, openings in swampy bush above Jacob kondre, Saramacca River, *23872.* Surinam to Pará.

MICONIA BRACTEATA DC. (179). BRITISH GUIANA: shrub to 2 m. high, flowers yellowish, Garraway Stream, Potaro River, *22963.* Peru to the Guianas.

There is every reason to believe that this collection represents the first record of the species in British Guiana. The collections cited under this name in the Synopsis (179) are of a different species, described below. It may be distinguished from *M. bracteata* by its basally attached filaments and much shorter calyx-lobes. In *M. bracteata* the calyx lobes are about twice as long as wide and the filaments are ventrally attached, as in the well known *M. nervosa.*

Miconia demerarensis Gleason, sp. nov. Sect. *Eumiconia Glomeratiflorae.* "*Miconia bracteata*" Gl. Syn. 179, non Triana. Frutex usque ad 2 m. altus; rami dense hirsuti, pilis minutissime plumosis. Petioli validi, 1–2 cm. longi, densissime hirsuti. Laminae ovatae vel ovato-oblongae, 10–18 cm. longae, 5–9 cm. latae, abrupte acuminatae, basi late acutae vel rotundatae, 5-nerviae, utrinque sparse hirsutae, ad venas primarias supra densissime hirsutae; venae secundariae 4–6 mm. dissitae, sub angulo ca. 80° divergentes. Inflorescentia fere decimetralis, a basi trichotoma; rami laterales glomerulos 2 gerentes, terminalis glomerulos 2 sessiles et saepe autem 2 breviter pedunculatos. Flores 5-meri, sessiles, dense fasciculati, bracteis ovatis 3–5 mm. longis, ciliatis intermixtis. Hypanthium campanulatum, 2.5–3.5 mm. longum, dense hirsutum, pilis adscendentibus. Calycis tubus hirsutus breviter productus; sepala ovato-oblonga obtusa, 1–1.5 mm. longa, hirsuta; dentes exteriores patuli subulati. Petala alba, oblonga, 4–5 mm. longa. Stamina isomorpha; filamenta arcuata, 2.5–3 mm. longa, antherae lineares, leviter curvatae, 2.8–3.9 mm. longae, connectivum basi incrassatum, infra thecas 0.5 mm. productum, simplex. Ovarium semi-liberum pilosum; stylus rectus, 6–7 mm. longus; stigma punctiforme. Bacca caerulea subglabra.

TYPE: collected at Groete Creek, Essequibo River, British Guiana, *Fanshawe 4464.* BRITISH GUIANA: Groete Creek, Essequibo River, *F4459;* Mazaruni Station, Mazaruni River, *F4144;* Mora-Balli Creek, Essequibo River, *F4058.* SURINAM: infrequent, subshrub overhanging stream, mixed high forest, North Ridge Cascade, Tafelberg, *24668.* Reported in the Flora of Surinam as *M. bracteata* (DC.) Triana.

MICONIA SILICICOLA Gleason (179). BRITISH GUIANA: Siba Creek, *F685.* Mount Duida, Mount Roraima, Venezuela.

MICONIA CAMPESTRIS (Benth.) Triana (179). BRITISH GUIANA: locally frequent, subshrub 1 to 2 m. high, ripe fruit black, from inundated land, Potaro River above Kaieteur Falls, *23346*. Valley of Upper Amazon River.

MICONIA PLUKENETII Naud. (179). BRITISH GUIANA: tree to 10 m. high, 12 cm. diameter, banks and swamps along Kamuni Creek, Groete Creek, Essequibo River, *22945*. Throughout the colony; French Guiana, Surinam, Trinidad.

MICONIA CERAMICARPA (DC.) Cogn. (180). BRITISH GUIANA: shrub in heavy *Mora* forest, dense second growth in windfall opening, Kamuni Creek, Groete Creek, Essequibo River, *22865a*. Common through forests of British Guiana; the Amazon Valley and the Guianas.

MICONIA POLITA Gleason (180). BRITISH GUIANA: occasional, subshrub to 2 m. high, leaves brittle, fruit pale china blue, pithy, drop at touch, river bank between Kangaruma and Amatuk, Potaro River, *23011*. Endemic.

MICONIA PTEROPODA Benth. (181). BRITISH GUIANA: Kuruabo Falls, Essequibo River, *F1709*. Northern South America.

MICONIA IBAGUENSIS (Bonpl.) Tr. BRITISH GUIANA: pubescent yellow-green shrub, flowers yellow-green, Mazaruni Station, Mazaruni River, *F.D. 114*.

MICONIA PRASINA (Sw.) DC. (181). BRITISH GUIANA: occasional tree 4–5 m. high, 5–8 cm. diameter, fruit globose, deep blue, secondary forest, white sand, mixed forest, Tukeit, Potaro River Gorge, *23053;* Potaro River below Tukeit, *23497*. Common throughout the colony; widely distributed throughout tropical America.

Miconia Maguirei Gleason, sp. nov. Sect. *Eumiconia, Paniculares.* Frutex 1–2 m. altus. Rami dense hirsuti, pilis ferrugineis usque ad 1 cm. longis, petioli 5–12 mm. longi, dense longeque hirsuti. Laminae chartaceae, obovato-ellipticae, 12–18 cm. longae, 6–9 cm. latae, abrupte acuminatae, obcrenato-denticulatae, basi cuneatae, 5-nerviae, jugo exteriori submarginali, supra et subtus ad paginam sparse hirsutae, pilis 3–4 mm. longis, subtus ad venas primarias densius longiusque hirsuti. Panicula in anthesi 3–5 cm. longa, ad nodos longe hirsuta, ad internodos densissime pubescens, pilis adscendentibus 0.4 mm. longis; bracteae oblongae ca. 1 mm. longae. Flores 5-meri brevissime pedicellati. Hypanthium tubulosum, 3.5 mm. longum, sparse hirsutum, pilis simplicibus vel glandulosis usque ad 1 mm. longis, atque minute adpresso-pubescens. Sepala triangularia, ca. 0.7 mm. longa sicut hypanthium pubescentia; dentes exteriores adnati, conici, sepala subaequantes. Petala alba, ovato-oblonga, 2.8 mm. longa. Stamina isomorpha; filamenta jam non evoluta; antherae lineares, 2.9 mm. longae, poro ventroterminali dehiscentes; connectivum simplex. Ovarium semi-inferum, 3-loculare, glabrum. Fructus (ex no. 23513) globosus valde 10-costatus.

TYPE: shrub 1–2 m. high, lax growth, flowers white, wallaba forest, Kaieteur Savanna, British Guiana, May 11, 1944, *Maguire & Fanshawe 23401*. New York Botanical Garden. BRITISH GUIANA: infrequent, trail Tukeit to Kaieteur Plateau, mixed forest, *23513*. The species is obviously related to those numbered 196 to 200 in Cogniaux's Monograph, of which only *M. tschudyoides* Cogn. (*M. robusta*) is known to occur in British Guiana, but differs from all of them in pubescence and especially in its unappendaged connectives.

MICONIA TOMENTOSA (L. C. Rich.) Don (179). SURINAM: shrub to 2 m.

high, petals pale pink, filaments purple, anthers pink, savanna, vicinity Sectie O, *25018*. Widely distributed in the Amazonian region, south to Bolivia and Rio de Janeiro, also in Cuba.

MICONIA spp. SURINAM: tree 10 m. tall, 8 cm. diameter, bark papery, fruit yellow, swampy bush, rear of Kwatta hede, Saramacca River, *23920;* leaves dark green above, light below, coriaceous, fruit blue, river banks above Kwatta hede, Saramacca River, *23936* (flowers lacking); small tree to 5 m., leaves and shoots clear green, fruit apparently yellow at maturity, along Toekoemoetoe Creek, about 3 km. below Base Camp, Saramacca River Headwaters, *24087* (flowers lacking, possibly a member of Sect. *Jucunda*); infrequent, shrub to 3 m., flowers lacking, overhanging East Ridge Gorge, high forest, Tafelberg, *24533* [obviously related to *M. disparilis* (Standley) R. O. Williams, but with 5-merous flowers and distinctly 5-pli-nerved leaves —I am reluctant to segregate it specifically without first seeing the stamens]; frequent small slender tree or shrub, 5 m. high, 6 cm. diameter, pubescence tawny, mixed high forest, below cliffs of west escarpment, Tafelberg, *24689* (flowers lacking, possibly a member of Sect. *Tamonea*); small tree overchanging Tafelberg Creek, Saramacca River Headwaters, *24906* (flowers lacking, possibly a member of Sect. *Eumiconia*, in general habit and pubescence it suggests *M. tschudyoides* Cogn.); frequent slender small tree to 5 m., mixed high bush, not seen flowering, *24654* (sterile, genus unknown, foliage suggestive of *Ossaea*).

APOCYNACEAE[102]

ALLAMANDA CATHARTICA L. SURINAM: frequent, arching scandent subshrub, flowers yellow, rather open savanna bush to 30 m. high, along railroad, vicinity km. 70, Sectie O, *23634;* common, scandent subshrub, flowers yellow, thickets and on trees, sandbanks along railroad bed, Kwakoegron, *23786*.

AMBELANIA ACIDA Aubl. BRITISH GUIANA: undergrowth tree 30 feet tall, 4 inches diameter, milk thick, leaves leathery, flowers white, fruit ovoid, grooved, yellow when ripe, seeds flattened, oblong, brown, in mixed forest, Mazaruni Station, Mazaruni River, *F529*.

ASPIDOSPERMA OBLONGUM A. DC. BRITISH GUIANA: tree 110 feet high, 24 inches diameter, entire trunk to upper limbs deeply fluted, latex copious, Kamuni Creek, Groete Creek, Essequibo River, *22832*. Northern Brazil, British Guiana, Surinam.

ASPIDOSPERMA DESMANTHUM Benth. BRITISH GUIANA: 90-foot tree, 16 inches diameter, leaves stiff, leathery, flowers in terminal corymbose inflorescence, mealy gray, inflorescence wooly, sandhills, wallaba forest, Demerara River, *F1226*. Guiana, northern Brazil.

CONDYLOCARPON MYRTIFOLIUM (Miq.) Muell.-Agr. BRITISH GUIANA: infrequent vine, flowers yellow, latex copious, clearings, high forest, Kamuni Creek, Groete Creek, Essequibo River, *22890;* vine with copious white latex from *Pterocarpus* tree, leaves supple, leathery, glossy, fruit terminal, paired, flattened elongated, yellow-brown, deeply segmented almost like beads on a string, pendent, seed stony, along river, Baramanni Creek, Waini River, N. W. D., *F2330;* 2 cm. diameter gray milky rope from a small *Toulicia*,

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leaves leathery, glossy, flowers in terminal umbellate inflorescence, creamy yellow, tubular, lobes apiculate, flowers wither very quickly, become orange, fruit pendent like beads on a string, individual drupes green, flat oval, Mabaruma, Aruka River, N. W. D., *F2457;* Waipi Creek, lower Mazaruni River, *F1410*. Guianas, northern Brazil, eastern Bolivia.

COUMA RIGIDA Muell.-Arg. BRITISH GUIANA: infrequent, tree 10–12 m. tall, 25 cm. diameter, copious white latex, fruit subglobose, green, not quite ripe, seeds flat, oval, testa brown, from bush island, Kaieteur Savanna, *23232*. Northeastern Brazil, Guianas.

FORSTERONIA n. sp. ? BRITISH GUIANA: rare vine, young fruit angled, green, Kaieteur Savanna, *23254*. The peculiar 4-angled follicles are quite unlike anything in *Forsteronia* known to me. Flowers are necessary for identification.

FORSTERONIA sp. BRITISH GUIANA: 6 cm. diameter soft black-brown rope with copious white sticky latex, from crown of a small *Ocotea*, leaves soft, wooly beneath, the hairs stellate, fruit terminal, bilobed, the two lobes spreading at an obtuse angle from each other, somewhat triangular, green, Groete Creek, lower Essequibo River, *F1996*. Mr. Krukoff has collected this species in Amazonian Brazil upon several occasions, but always in fruit, so I am unable to describe the species which apparently is new. The leaves strikingly resemble those of *F. spicata*, but the follicles are very distinct.

FORSTERONIA GRACILIS (Benth.) Muell.-Arg. BRITISH GUIANA: 2–3 cm. diameter gray-black, stiffly pliable rope from crown of a *Mora* in *Mora* forest, leaves thinly leathery, glossy, flowers in axillary elongated bifurcate inflorescences, creamy white, plentiful thin, white, watery latex, Kauria Creek, lower Cuyuni River, *F1418;* 3 cm. brown scaly rope from crown of a greenheart in mixed forest, also common on *Mora* trees, thin white latex present in all parts, leaves leathery, male flowers in short, glaucous green, paired spikes on a long terminal peduncle, fruit on separate peduncles, 2–4 together, pale green, pithy, fleshy, seed conical, creamy, testa bony, Takutu Creek to Puruni River, Mazaruni River, *F2113*. SURINAM: rope, flowers white, latex white, mixed montane high forest, North Ridge, Tafelberg, *24799*. Guiana, northern Brazil.

My specimen of *F2113* bears leaves exactly like those of *F1418*, which is typical flowering *F. gracilis*. In the inflorescence of the former, however, there are two pairs of very young follicles, and in addition four or five objects which resemble the fruits of a *Viburnum*. These I have dissected to no avail, and regard them possibly as galls of some sort. I suppose these are the objects that led Mr. Fanshawe to interpret the flowers as dioecious.

GEISSASPERMUM SERICEUM (Sagot) Benth. BRITISH GUIANA: tree over 100 feet high, 20 inches diameter, bark furrowed, bole fluted, flowers whitish within, corolla lobes without have silky brown indumentum, leaves whitish below, mixed forest, Malali Rapid, Demerara River, 85 miles south of Georgetown, *D449*.

HIMATANTHUS ARTICULATA (Vahl) Woods. BRITISH GUIANA: tree 50 feet tall, 12 inches diameter, thick milk, unbuttressed, leaves in dense whorls at tips of branches, leathery, thick, flowers white, tubular, in articulate cymes, buds long and narrow, Mazaruni Station, Mazaruni River, *F643*. SURINAM: small tree, south savanna, vicinity Arawak village of Mata, Zanderij I, *24964*.

HIMATANTHUS BRACTEATA (A. DC.) Woods. BRITISH GUIANA: occasional, tree 6–8 m. high, 10 cm. diameter, latex white, copious, fruit of 2 follicles, pendent, glossy green, dehiscent at maturity, seeds winged, from bush island, Kaieteur Plateau, *23199*. SURINAM: infrequent, tree to 15 m. tall, 25 cm. diameter, copious white latex from broken petioles, stems, etc. hardening into tough gum with properties of chicle, flowers white, associated with galata, streamside, North Ridge Cascade, Tafelberg, *24667*. Northern Brazil, British Guiana, Surinam.

MACROPHARYNX SPECTABILIS (Stadelm.) Woods. BRITISH GUIANA: 2 cm. rope, leaves paired, fleshy, flowers tubular, white, in axils, pendent, shortly stalked, calyx lobes ciliate, linear-lanceolate, corolla of 2 urn-shaped portions, wallaba forest, Moraballi Creek, Essequibo River, *F1299;* sandhills, Demerara River, *F1196*.

MALOUETIA TAMAQUARINA (Aubl.) A. DC. BRITISH GUIANA: small tree, 5 m. high, to 8 cm. diameter, latex copious, flowers yellow, banks and swamps along Kamuni Creek, Groete Creek, Essequibo River, *22926; F1732;* small riparian undergrowth tree of lax growth with white latex, leaves supple, leathery, inflorescence axillary, of many paired flowers on long stalks, all parts varnished, buds yellowish with red gloss, convolute, corolla lobes hooded, pale yellow on upper part, brownish on lower, fruit paired, cylindrical, green, when ripe brown to black, dehiscent, Baramanni Creek, Waini River, N. W. D., *F2331*. Guianas, northern Brazil.

MALOUETIA SCHOMBURGKI Muell.-Arg. BRITISH GUIANA: lax shrub or small tree 8 feet tall, grows to 20 feet and 3 inches diameter, white latex, leaves supple, thinly leathery, flowers axillary, long-stalked, many-rayed from a very short peduncle, calyx green, lobes spreading to revolute, corolla tube greenish, glabrous, corolla lobes reflexed, white with a greenish tinge, partly twisted, with revolute margins and erect white hairs on upper surface, staminal cone extruded, from *Euterpe* swamp, Baramanni Creek, Waini River, N. W. D., *F2336*. British Guiana.

MANDEVILLA SUBSPICATA (Vahl) Mgf. SURINAM: frequent, vine, flowers yellow, orange-striped throat, rather open savanna bush 30 m. high, Sectie O, vicinity km. 70, along railroad, *23614;* km. 68, vicinity Sectie O, *24994;* vine, flowers yellow, Savanna III, Tafelberg, *24269;* frequent, east escarpment, Tafelberg, *24560*. Venezuela, Guianas.

MANDEVILLA BENTHAMII (A. DC.) K. Sch. BRITISH GUIANA: frequent, perennial with subfleshy stems, leaves glaucous below, flowers orange-yellow, suffused with red on narrow part, glossy, young fruit crimson, in moist sand, Kaieteur Plateau, *23128*. Known only from the Kaieteur Plateau.

MANDIVILLA VANHEURCKII (Muell.-Arg.) Mgf. BRITISH GUIANA: vine climbing to 6 m., leaf margins and midrib red, flowers rich yellow, narrow portions of tube crimson, glossy, young fruit crimson, Kaieteur Savanna, *23170*. I have previously cited this species only from Amazonian Peru; and in the Pacaraima Mountains I should expect to find *M. subcarnosa* (Benth.) Woods. instead of the Peruvian species. The leaves of *23170*, however, correspond much more closely with those of *M. Vanheurckii*.

MANDEVILLA sp. SURINAM: vine, corolla yellow, orange-red in throat, savanna, Sectie O, km. 68, *25024*.

MESCHITES TRIFIDA (Jacq.) Muell.-Arg. SURINAM: frequent, vine, flower tube pink, throat cream, follicles connate at tip only, along Saramacca River, vicinity Brokolonka, *23791*.

ODONTADENIA GRANDIFLORA (G. Mey.) Miq. BRITISH GUIANA: hard rope, on tree, milk copious, leaves stiff, flowers in axillary panicles, tubular, calyx yellow, corolla salmon-pink, striped scarlet on tube, stamens in a ring, in swamps, Kaow Island, Essequibo River, *F773;* Essequibo River by Yakamore Creek, *F1357.* SURINAM: frequent ornamental vine, corolla throat striately orange-red within lobes shading to delicate orange-pink, fragrant, river bank, vicinity Saron Creek, Saramacca River, *23771.*

ODONTADENIA NITIDA (Vahl) Muell.-Arg. BRITISH GUIANA: milky vine from low bushy vegetation along creek, leaves thinly leathery, flowers tubular, cream-yellow, calyx glossy, young fruit paired, flat, cylindrical, green, Koboremo Creek, Aruka River, N. W. D., *F2516.* Trinidad to Peru.

ODONTADENIA PUNCTICULOSA (A. Rich.) Pulle. BRITISH GUIANA: soft black rope, copious latex, leaves coriaceous, flowers in axillary panicles, buds glabrous, calyx downy, flowers tubular, yellow lobes convolute, spreading tube contracted ½ inch above calyx, Winiperu Creek, miscellaneous forest, *F302.*

Parahancornia tabernaemontana Woodson, sp. nov. Arbor ca. 15 m. alta, ramulis dichotomis glabris. Folia opposita usque 2 cm. petiolata glabra, lamina late elliptica nisi obovato-elliptica firmiter membranacea apice obtusa basi late acuta 10–13 cm. longa 5.5–8.0 cm. lata glabra. Inflorescentia terminalis thyrsiformis multiflora 3.5–4.0 cm. pedunculata glabra vel indistincte papillata. Flores mediocres albi, pedicellis ca. 0.5 cm. longis. Calycis laciniae 5, quadrato-orbiculares intus minute squamelligeres extus minute papillatae. Corollae hypocrateriformes tubo ca. 0.5 cm. longo basi ca. 0.15 cm. diam. extus glabro intus tomentoso sub medio staminigero lobis anguste oblongo-ellipticis ca. 0.8 cm. longis sparse ciliolatis. Antherae ca. 0.3 cm. longae. Ovarium truncate conicum 2-loculare ca. 0.15 cm. altum apice puberulo-papillatum, stigmate conico-umbraculiformi anguste 2-apiculato ca. 0.2 cm. longo. Fructus ignotus.

TYPE: high mixed forest, east slope of Hill I, Tafelberg, Surinam, September 13, 1944, *Maguire 24719.* Missouri Botanical Garden; New York Botanical Garden.

Outstanding in the genus as known at present because of its large, membranaceous leaves, pentamerous calyx with internal squamellae, large anthers, and completely 2-celled ovary, all of which probably may be interpreted as "primitive" characters. Dr. Maguire notes the presence of copious white latex.

PRESTONIA ACUTIFOLIA (Benth.) K. Sch. SURINAM: frequent, vine, flower tube yellow, throat white, follicles connate for entire length, vicinity Brokolonka, Saramacca River, *23790.*

PRESTONIA SURINAMENSIS Muell.-Arg. BRITISH GUIANA: vine from bushy growth, all parts bristly, hair brown, leaves herbaceous, inflorescence axillary, oblong-capitate, flowers yellow, tubular, rotate, subtended by lanceolate bracts, anthers arching inwards to block throat, Takutu Creek to Puruni River, Mazaruni River, *F2010.* Guianas, northern Brazil.

PRESTONIA MARGINATA (Benth.) Woods. BRITISH GUIANA: vine, on *Myrcia,* leaves leathery, flowers in axillary fascicles, pedicels white, calyx pale pink, tube yellow, Takutu Creek to Puruni River, Mazaruni River, on rocks in falls, *F2138.*

PRESTONIA PERPLEXA Woods. BRITISH GUIANA: occasional, vine with

milky latex, flowers pale yellow, lobes reflexed, tube partly crimson, calyx crimson, young fruit crimson, riverside, Potaro River, above Kaieteur Falls, *23351*. This appropriately named species has been known to me previously only from a specimen without data, collected by Lund in Brazil and deposited in the herbarium at Copenhagen. It is gratifying to have a second, fully documented specimen.

RHABDADENIA BIFLORA (Jacq.) Muell.-Arg. SURINAM: frequent perennial to 1 m. high, flowers white, in drier marsh areas, road to Carl Francois along Saramacca River, km. 79 from Paramaribo, *23596*.

Stemmadenia cerea Woodson, sp. nov. Arbuscula 6 m. altitudine attingens. Ramuli glabri graciles lignosi divaricate compositi. Folia opposita glabra firmiter membranacea supra saturate subtus dilute viridia; petiolo 0.5–0.7 cm. longo; lamina oblongo-elliptica apice longiuscule subcaudato-acuminata basi obtusa in petiolo sensim attenuata 6.5–8.0 (usque 12.0 ?) cm. longa medio 2.0–3.0 (usque 6.0 ?) cm. lata. Inflorescentiae pauci- vel 1-florae terminales vel pseudo-axillares; pedunculo ad 1.5 cm. longo vel subnullo; pedicellis ca. 1 cm. longis glabris. Calycis laciniae aliquantum inaequales erectae basi imbricatae plus minusve petalaceae ut videntur haud foliaceae glabrae ovato-oblongae valde obtusae 0.8–1.0 cm. longae intus basi multi-squamelligerae. Corollae hypocrateriformes albidae cereae tubo 3.0–3.2 cm. longo basi ca. 0.4 cm. diam. dein sensim angustato tertia parte superiori staminigero ibique ca. 0.15 cm. diam. deinde in faucibus cylindrato-conicis dilatato ostio ca. 0.5 cm. diam. lobis patento-patulis late elliptico-dolabriformibus ca. 0.5 cm. longis. Antherae sessiles triangulari-sagittatae acuminatae basi rigide 2-dentatae ca. 0.5 cm. longae glabrae. Carpella glabra oblongo-ovoidea ca. 0.3 cm. alta apocarpa nectario ½ altitudinis omnino adnato vix bene manifesto. Folliculi immaturi oblique ellipsoidei vex apiculati 3 cm. longi ca. 1 cm. diam.

TYPE: tree 6 m. high, corolla lobes cream-white, dense forest, 700 m. altitude, northwestern portion of Kanuku Mountains, Mount Iramaikpang, British Guiana, April 22–23, 1938. *A. C. Smith 3606*. Missouri Botanical Garden. COTYPE: occasional shrub to 3 m. high, latex copious, white, flowers reflexed, white, waxen, from *Dicymbe* forest, Tukeit, British Guiana, May 18, 1944, *Maguire & Fanshawe 23536*.

The type specimen, sent me for determination some years ago, was not immediately recognized as a *Stemmadenia* because its general aspect is rather more suggestive of such Tabernaemontanas as *T. flavicans*, in spite of the over-sized calyx. Stemmadenias usually are readily distinguishable from other Tabernaemontanoideae by means of the epistaminal ridges within the corolla tube. These vary considerably amongst the various species, but in *S. cerea* they are not apparent in my dissection. The wholly adnate nectary (discus) and lack of definite contortion of the corolla throat also are novelties in the genus, and probably indicate *S. cerea* as a distinctly "advanced" species. Similar petalaceous calyx lobes, however, occur in such Central American congeners as *S. lagunae*, and the structure of the anthers, calycine squamellae, ovary, and petiolar rings all are quite characteristic of *Stemmadenia*.

It should be noted that the Maguire and Fanshawe number, my duplicate of which bears a single small flower bud, differs from that of Dr. Smith in having conspicuously larger leaves as indicated by the parenthetic

measurements in my description. The two collections come from geographically distinct regions. Present evidence, however, certainly does not warrant specific distinction.

STEMMADENIA GRANDIFLORA (Jacq.) Miers. SURINAM: frequent, shrub to 3 m. tall, flowers yellow, about thickets, coastal jungle, road to Carl Francois along Saramacca River, km. 40 from Paramaribo, *23585*. Widely distributed from southern Mexico to northern Brazil. My duplicate is accompanied by a single detached, damaged flower, and the determination cannot be made without qualification.

TABERNAEMONTANA ALBESCENS Rusby. BRITISH GUIANA: shrub with copious white latex, flowers waxen white, solitary or 2–3, calyx adpressed to corolla tube, corolla lobes convolute, reflexed, fruit bilobed, flattened, ovoid, in mixed forest, Mahdia River-Potaro River, Bartica-Potaro Road, ***F993***.

TABERNAEMONTANA ALBIFLORA (Miq.) Pulle. BRITISH GUIANA: shrub 4–6 feet high, leaves leathery, flowers white, tubular, corolla lobes reflexed, Marbaruma, Aruka River, N. W. D., *F2358*. SURINAM: frequent, small tree to 3 m. high, flowers white, vicinity Krappa Camp (2), km. 3.5, Saramacca River Headwaters, *24888;* flowers white, border of woods, Grasi Falls, Saramacca River, *24943*. Known from British Guiana, Surinam, and French Guiana.

TABERNAEMONTANA ATTENUATA (Miers) Urb. SURINAM: frequent, small tree, flower lobes yellow, outside throat white, tube pink, montane forest, vicinity Krappa Camp (2), Saramacca River Headwaters, *24139;* frequent, small tree, flower tube pink, lobes yellow, steep slopes, Tafelberg, *24540*. Guianas, northern Brazil, Trinidad.

TABERNAEMONTANA HETEROPHYLLA Vahl. BRITISH GUIANA: frequent, shrub to 2 m. high, in high forest, Kamuni Creek, Groete Creek, Essequibo River, *22904*. SURINAM: shrub to 3 m. tall, dichotomously branched, milky latex, flowers white, in the branch forks, frequent, dense secondary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22745*. Guianas, northern Brazil.

TABERNAEMONTANA TETRASTACHYA HBK. BRITISH GUIANA: weak shrub or scrambler with lower stems arching about the ground and shoots to 12 feet tall from water-logged sections of river bank, latex white, sticky, leaves paired, thinly leathery, glossy, flowers in axillary inflorescence, buds green, convolute, flowers white, petals reflexed, Takutu Creek to Puruni River, Mazaruni River, *F2158; F2013*. SURINAM: infrequent, flowers white, petals reflexed, leaves coriaceous, corrugated, latex copious, river banks below rapids, Jacob kondre, *23840;* small tree to 6 m., in rather open savanna bush to 30 m. high, Sectie O, along railroad, vicinity km. 70, *23638a*. Guianas, northern Brazil, eastern Bolivia.

TABERNAEMONTANA UNDULATA Vahl. BRITISH GUIANA: small tree 4–5 m. tall, 5 cm. diameter, primary forest and openings, Kamuni Creek, Groete Creek, Essequibo River, *22846*. SURINAM: tube red, lobes white, east side, savanna, Zanderij I, *25057;* small tree to 8 m. tall, in high wallaba forest, km. 18.5, Coppenam River Headwaters, *24828*. Guianas, Trinidad, northern Brazil.

var. ? SURINAM: frequent, small tree 5 m. high, 5 cm. diameter, flowers white, copious latex, pina swamps, vicinity Krappa Camp (2), Saramacca River Headwaters, *24125*.

Tabernaemontana versicolor Woodson, sp. nov. Arbuscula ca. 1 m. alta. Ramuli divaricate compositi glabri maturitate cortice rimoso. Folia opposita subsessilia coriacea glabra penninervia anguste elliptico-lanceolata basi subcuneata apice longiuscule subcaudato-acuminata 7–10 cm. longa medio 2.0–2.3 cm. lata. Inflorescentiae dichasiales pauciflorae terminales vel pseudoaxillares; pedunculus bifurcatus ca. 0.7–1.0 cm. longus utroque latere subbiflorus; pedicelli 1.0–1.2 cm. longi graciles glabri. Calycis lobi erecti virides aequales vel subaequales ovato-elliptici obtusi ca. 0.2 cm. longi extus puberulo-papillati intus basi minute plurisquamelligeri. Corollae delicatae versicolores tubus cylindricus ca. 1 cm. longus basi ca. 0.2 cm. diam. paulo infra medium staminiger ibique intus pilosus caeterumque glaber ut dicitur ruber ostio purpureo-rubellus lobi ut videntur gilvi patuli tubo aequilongi oblique obovati in alabastrum longiuscule ovoideum vix crassum dextrorsum involuti et implicati. Antherae sessiles latiuscule triangulares 0.35 cm. longae basi ca. 0.1 cm. latae apice sensim acuminatae basi tenuissime bilobatae filamenta adnata pilosula excepta ominino glabrae. Stigmatis pars apicalis subglobosa annulo basali tenuiter membranaceo patulo. Stylus ca. 1 cm. longus. Carpella glabra ovoidea apocarpa ca. 0.1 cm. alta nectario annulari ½ altitudinis ovarii attingente omnino adnato. Folliculi haud visi.

TYPE: rare shrub 1 m. high, corolla tube red, lobes reflexed, convolute, mauve-red center, Potaro River below Tukeit, British Guiana, May 16, 1944, *Maguire & Fanshawe 23482*. Missouri Botanical Garden; New York Botanical Garden.

I wish that I could assign *T. versicolor* to one of the segregate genera recognized by my friend Dr. Fr. Markgraf, of Berlin-Dahlem, in his revision of the American Tabernaemontanoideae (Notizbl. **14**: 151–186. 1938). As I understand them, the presence of a manifest though adnate nectary would assign our plant to *Tabernaemontana* in the very restricted sense, while the general habit of the plant recalls *Peschiera*. I am inclined to ally *T. versicolor* with such species known to me as *T. arcuata* and *T. psychotrifolia;* it might be viewed provisionally as a connecting link between the boreal *Tabernaemontana* and the austral *Peschiera* in much the same way as are *T. apoda* of Cuba, and *T. Schippii* of Central America. I have not yet become familiar with Markgraf's interpretation; therefore I probably shall create less confusion by continuing for the present to use *Tabernaemontana* in its broader sense.

LACMELLEA FLORIBUNDA (Poeppig) Benth. & Hook. SURINAM: tree to 10 m. tall, 15 cm. diameter, maka-pina-tete swamp, km. 13, vicinity Kwatta Camp (3), Coppenam River Headwaters, *24848*. Northern Brazil, Surinam.

LACMELLEA ARBORESCENS (Muell. Arg.) Mgf. BRITISH GUIANA: 100 foot tree, 12 inches diameter, milk white, flowers white, fruit yellow, creek swamp, Moraballi Creek, Essequibo River, *F710;* 20 foot tree, 6 inches diameter, leaves leathery, glabrous, flowers bunched in axils, stalked, white, lobes reflexed, buds yellow-green, rocky island in falls, Kurihi Rapids, Essequibo River, *F1708;* 70 foot tree, 8 inches diameter, flowers axillary, tubular, white, mixed mora-turu forest, Makauria Creek, *F556*.

I have just received from my friend Dr. Fr. Markgraf a photostat copy of his restoration of *Lacmellea* (Notizbl. **15**: 615–629. 1941). Formerly I had been unimpressed by arguments for the congenericity of that genus and *Zschokkea* Muell. Arg. (cf. Monachino, in Lloydia **7**: 275. 1944); however, Markgraf disposes of all questions quite convincingly.

ASCLEPIADACEAE[103]

ASCLEPIAS CURASSAVICA L. SURINAM: seven-stemmed, unbranched, 1 m. high, rootstock horizontal, shrub savanna in sand, Charlesburg Rift, bordered by swamps and primary jungle, 3 km. north Paramaribo, *22729*. Widely distributed in tropical and subtropical America at low and moderate elevations; adventive in the eastern hemisphere.

BLEPHARODON NITIDUS (Vell.) Macbr. BRITISH GUIANA: rare, vine with white latex, trailing on *Byrsonima*, fruit elliptical, pendent, glossy green, Kaieteur Savanna, *23279*. SURINAM: flowers greenish, corona white, km. 68, vicinity Sectie O, *24996*. Colombia to northeastern Brazil.

GONOLOBUS RIPARIUS HBK. BRITISH GUIANA: vine with milky juice, from crown on unknown tree in ropy forest, leaves soft, scabrous, flowers in axillary fascicles on long peduncle, calyx green, reflexed, purple-tipped-corolla lobes convolute, green, fleshy, white-margined on one side, throat similarly white-rimmed, Takutu Creek to Puruni River, Mazaruni River, *F2064*. Eastern Colombia, Venezuela, British Guiana.

MATELEA STENOPETALA Sandwith. BRITISH GUIANA: occasional, vine, flowers pale cream, petals spreading, riverside, Potaro River above Kaieteur Falls, *23365*. British Guiana.

METASTELMA BRASILIENSE K. Sch. SURINAM: frequent, weak shrub becoming scandent or vine, flowers greenish, Savanna II, Tafelberg, *24236;* frequent, subshrub becoming a scandent and twining vine, flowers white, open rock, Savanna VIII, Tafelberg, *24527*. Guianas, eastern Brazil.

In 1941 I published the results of several years of delving into the generic outlines of the American Asclepiads (Ann. Missouri Bot. Gard. **28**: 193–244. 1941). I came to the conclusion that a return to the rather simple pre-Decaisnean, and in some instances pre-Brownian, classification was of distinct advantage. *Metastelma* was one of the several segregate genera whose return to *Cynanchum* I recommended, but without making any of the many new combinations. This was necessary at the time because of my inadequate knowledge of the nomenclatural situation in the majority of cases. My ignorance not being appreciably dissipated as yet, I am still labeling Metastelmas, etc., with their currently accepted names until such time as I can revise them competently.

METASTELMA STENOLOBUM Dene. SURINAM: frequent, vine, flowers bronze without, throat bronze, river banks below rapids, Jacob kondre, Saramacca River, *23811*. British Guiana, Surinam, northern Brazil.

ROULINIELLA GUIANENSIS (Dene.) Jonker. BRITISH GUIANA: vine with plentiful white gummy latex, from fallen tree at river edge, leaves soft, flowers in axillary fascicles, calyx green, petals thin, fleshy, white on reverse, purplish, striated paler on inner face, ring of leafy white staminodes [!] almost enclosing the stamens, Sebai Creek, Kaituma River, *F2423*. SURINAM: infrequent, vine, flowers with purple petals, white-striped within, corona white, river bank, vicinity Saron Creek, Saramacca River, *23772;* infrequent, petals white without, purple-striped within, vicinity Brokolonka, Saramacca River, *23789*. British Guiana, Surinam.

As in the case of *Metastelma* (vide ante), I am still of the opinion that *Rouliniella* should be returned to *Cynanchum*, although I am not in a position as yet to make the necessary transfers.

[103] By Robert E. Woodson, Jr.

TASSADIA PROPINQUA Dene. BRITISH GUIANA: occasional, vine with milky latex, flowers white, riverside, Potaro River above Kaieteur Falls, *23350;* milky vine, leaves stiff, wiry stems, flowers in loose panicles, small corolla, calyx pale cream, fruit 2-horned, narrow-lanceolate or subulate, 1 inch long, Mazaruni Station, Mazaruni River, *F215.* Guianas, northern Brazil.

My remarks concerning *Metastelma* and *Rouliniella* apply to *Tassadia* as well.

CONVOLVULACEAE[104]

This is an enumeration of the Convolvulaceae collected by Bassett Maguire and his collaborators during the New York Botanical Garden Tropical Expedition—1944 in British Guiana and Surinam. Moreover a few notes are given on some other Convolvulaceae collected in Guiana which may be of interest as an addition to the author's papers on the Surinam representatives of this group, published in the Flora of Surinam **4**: 66–102. 1932; in Lanjouw, Additions to Pulle's Flora of Surinam, Rec. trav. botan. néerland. **32**: 255–257. 1935; and in Pulle, Flora of Surinam, Additions **4**: 468–471. 1937.

MARIPA GLABRA Choisy. SURINAM: rope, flowers pale blue, low forest, Coppenam River Headwaters, vicinity Blackwater Camp (No. 5), *24194.* Known from several localities in Surinam and from French Guiana (see Gleason in Bull. Torr. Bot. Club **56**: 111. 1929).

BONAMIA MARIPOIDES Hallier f. SURINAM: liana, climbing to 20 m., leaves dark green above, tawny sericeous beneath, Saramacca River, bush to rear of Jacob kondre, *23761.* Known from several localities in Surinam and from Northern Brazil.

ANISEIA MARTINICENSIS (Jacq.) Choisy. SURINAM: frequent, repent vine, flowers white, sandbanks along railroad bed, Saramacca River, Kwakogroen, *23779.* Widely spread through the tropics of the Old and the New World.

IPOMOEA FRAGRANS (Boj.) Boj. ex Choisy.

As I have pointed out in my paper on the Convolvulaceae of Malaysia, III, Blumea **3**: 564–566. 1940, *Ipomoea Parkeri* Choisy and its var. *subsericea* Meissn., described from British Guiana and from Surinam respectively, are synonyms of *Ipomoea fragrans* (Boj.) Boj. This name has priority and has to be used for the Guiana plants (See Van Ooststr., Flora Suriname **4**: 92. 1932, id. in Lanjouw, Additions, 1935, p. 256). Tropical America (British Guiana, Surinam); tropical Africa, Madagascar and adjacent islands; Malay Archipelago, Philippine Islands, in marshes along coasts and rivers or in marshy forests.

IPOMOEA TILIACEA (Willd.) Choisy. SURINAM: common, flowers blue, Charlesburg Rift, 3 km. north of Paramaribo, *22786.* Tropical America, West tropical Africa, in the Malay Archipelago only known from the Talaud Islands and from New Guinea.

IPOMOEA SQUAMOSA Choisy. BRITISH GUIANA: vine, corolla blue without, paler at base, deep blue distally within, basin of Rupununi River, Isherton, lat. about 2° 20′ N., edge of forest, *A. C. Smith 2464.* In Surinam only known from the Upper Sipaliwini River. Further in Northern Brazil, Colombia, Peru and Bolivia. Most probably new to British Guiana.

[104] By S. J. van Ooststroom.

IPOMOEA QUAMOCLIT L. SURINAM: frequent, vine, flowers rose-scarlet, Saramacca River, weed about village of Jacob kondre, *23800*. Circumtropical.

IPOMOEA PHILLOMEGA (Vell.) House. BRITISH GUIANA: Kamuni Creek, Groete Creek, Essequibo River, clearings in high forest, frequent, vine, flowers purple-red. *23891*. Additional collections are: *A. C. Smith 3587:* n. w. slopes of Kanuku Mountains, in drainage of Moku-moku Creek (Takutu tributary), dense forest, alt. 150–500 m.; and *N. Y. Sandwith 248:* Essequibo River, Moraballi Creek, near Bartica, bush-rope in mixed forest, alt. near sea-level, sepals dull greenish-mauve, corolla pinkish-magenta. Both were received by the Utrecht herbarium under the name *Ipomoea cardiosepala* Meissn. SURINAM: frequent, flowers purple, along railroad near km. 70, *23637*. Tropical Central America and the West Indies through Colombia, Venezuela, British Guiana, Surinam and French Guiana to Northern and Eastern Brazil.

BORAGINACEAE[105]

CORDIA BICOLOR A. DC. BRITISH GUIANA: tree 90 feet high, 16 inches diam., unbuttressed, mixed forest, Takutu Creek to Puruni River, Mazaruni River, *F2071* (*F.D. 4807*). Widely distributed in tropical America.

CORDIA EXALTATA Lam. var. MELANONEURA (Klotsch) Johnston. BRITISH GUIANA: tree to 100 feet, 16 inches diam., leaves glossy, thick and brittle, fruit in flat panicles, black and fleshy when ripe, Moraballi Creek, Essequibo River, *F589* (*F.D. 3325*); small tree 12 feet high, same locality, *F1281* (*F.D. 4017*). Recorded only for middle and western British Guiana.

CORDIA FALLAX Johnston. BRITISH GUIANA: tree 90 feet high, 16 inches diam., unbuttressed, mixed forest, Takutu Creek to Puruni River, Mazaruni River, *F2081* (*F.D. 4817*). Apparently endemic to British Guiana.

CORDIA MACROSTACHYA (Jacq.) R. & S. SURINAM: shrub to 2 m. high, flowers white, open scrub land on sand, Charlesburg Rift, 3 km. north Paramaribo, *22776*. Widely distributed in tropical America.

CORDIA NERVOSA Lam. BRITISH GUIANA: small tree to 5 m. high, 3 cm. diam., flowers white, fruit globose, scarlet, occasional *Dicymbe* forest on white sand, Trail Tukeit to Kaieteur Plateau, *23094;* shrub or small tree 2 m. high, flowers white, fruit red, Kaieteur Savannas, *23400*. SURINAM: small tree, flowers white, opening in *Clusia* bush, vicinity Savanna VIII, Tafelberg *24624;* shrub, west escarpment, Tafelberg, *24673*. Kaieteur Savanna, British Guiana to French Guiana and adjacent Brazil. Apparently previously not recorded for Surinam.

CORDIA NODOSA Lam. BRITISH GUIANA: tree 6–7 m. high, *Mora* forest, Kamuni Creek, Groete Creek, Essequibo River, *22810*. Widely distributed in tropical America.

CORDIA POLYCEPHALA (Lam.) Johnston. SURINAM: shrub to 3 m. high, flowers white, open scrub land on sand, Charlesburg Rift, 3 km. north Paramaribo, *22778*. Widely distributed in tropical America.

CORDIA SCHOMBURGKII DC. SURINAM: subshrub, locally common in clearings, Kwatta hede, Saramacca River, *23924*. Guiana, Trinidad and Tobago.

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[105] By I. M. Johnston.

VERBENACEAE[106]

AEGIPHILA ELATA SW. BRITISH GUIANA: Moraballi Creek, Essequibo River, *F1291.*

AEGIPHILA INTEGRIFOLIA (Jacq.) Jacks. BRITISH GUIANA: Potaro River Gorge, *23080;* approach to the Kaieteur escarpment, *23476.* The species is widely distributed from Trinidad, Venezuela, and Colombia to Bolivia and São Paulo, Brazil.

AEGIPHILA LAEVIS (Aubl.) Gmel. SURINAM: frequent, liana, second growth, secondary jungle, 3 km. north of Paramaribo, *22782.* The species is known also from Colombia, British and French Guiana, and Brazil.

AMASONIA CAMPESTRIS. (Aubl.) Moldenke. SURINAM: frequent, flowers cream, bracts orange-red, annual to 5 cm. tall, sand banks along railroad bed, Kwakoegron, Saramacca River, *23780.* The species is widespread from Trinidad, Venezuela, and the Guianas, to Brazil.

CITHAREXYLUM MACROPHYLLUM Poir. BRITISH GUIANA: Takutu Creek, Puruni River, Mazaruni River, *F2049.*

PETREA BRACTEATA Steud. BRITISH GUIANA: Kamuni Creek, *22885;* Groete Creek, Essequibo River, *F1734; F1735.* SURINAM: Coppenam watershed, *24831.* The species is known only from the Guianas and northern Brazil.

PETREA MACROSTACHYA Benth. BRITISH GUIANA: Takutu Creek, Puruni River, Mazaruni River, *F2118.*

STACHYTARPHETA CAYENNENSIS (L. C. Rich.) Vahl. BRITISH GUIANA: Potaro River, *22990.* SURINAM: Charlesburg Rift, Paramaribo, *22771.* The species is widely distributed from Mexico and Jamaica to Paraguay and Argentina.

STACHYTARPHETA JAMAICENSIS (L.) Vahl. BRITISH GUIANA: Potaro River, *22989.* SURINAM: roadside weed, Carl Francois, *23587.* The species is widely distributed from Florida and Mexico south to Matto Grosso and Pernambuco, Brazil.

VITEX COMPRESSA Turcz. BRITISH GUIANA: Essequibo River below Monkey Jump, *F1327;* Kaow Island, Essequibo River, *F831.* SURINAM: Saramacca River, *23902, 23940, 24011.* The species is known from Trinidad, Venezuela, Colombia, and the Guianas south to Ceará and Pará, Brazil, and possibly northern Peru.

VITEX STAHELII Moldenke. BRITISH GUIANA: Mazaruni Station, *F492.*

VITEX TRIFLORA Vahl. BRITISH GUIANA: Moraballi Creek, Essequibo River, *F1292.* SURINAM: Coppenam watershed, *24837.* The species is known only from the Guianas, northern Brazil, and eastern Peru.

GESNERIACEAE[107]

Alloplectus savannarum Morton, sp. nov. Scandens, caulibus ca. 25 cm. longis, teretibus, non ramosis, deorsum ca. 5 mm. diam., dense flavo-tomentosis, epidermide haud squamosa; folia opposita, inaequalia, majora longe petiolata, petiolo 4–5 cm. longo, 1.5–2 mm. diam., flavo-tomentoso, lamina late elliptica, 13.5–15 cm. longa, 6–6.5 cm. lata, breviter acuminata, basi

[106] By Harold N. Moldenke.

[107] By C. V. Morton. Published by permission of the Secretary of the Smithsonian Institution.

valde obliqua, non decurrente, minora brevius petiolata (usque ad 1.3 cm.), lamina ovata, usque ad 7 cm. longa et 4.5 cm. lata, omnia herbacea, subtus pallidiora, perspicue dentata (dentibus utroque latere usque ad 40), basi subintegra, supra breviter pilosula, subtus dense pilosa, venis primariis in foliis majoribus 7–9-jugis, arcuatis; inflorescentiae axillares, floribus geminis, pedicellatis, pedicellis 9–12 mm. longis, crassis, densissime tomentosis, bracteis nullis vel mox deciduis; calyx coccineus, lobis erectis, paullo inaequalibus, postico et 2 anterioribus replicatis, 2 lateralibus subplanis, ambitu subovatis, ca. 3 cm. longis, basi fere 2 cm. latis, subcordatis, perspicue dentato-laciniatis (dentibus ca. 9 utroque latere), apice subintegris, utrinque dense flavo-pilosis; corolla flavescens, obliqua, basi non vel vix saccata, 25–28 mm. longa, tubo basi 6 mm. diam., glabro, sursum ampliato et curvato, dense flavo-sericeo, intus apicem versus parce pilosulo, usque ad 10 mm. diam., fauce contracto, ca. 7 mm. lato, limbo parvo, lobis 5, aequalibus, deltoideis, erectis, ca. 2 mm. longis et latis, rotundatis, externe sericeis, intus glabris; stamina in vaginam glabram ca. 8 mm. longam connata, filamentis subaequalibus, contortis, glabris, antheris primo connatis, 2 mm. longis, 2.5 mm. latis, glabris, loculis late oblongis, discretis; ovarium dense pilosum; stylus glaber; stigma bilamellatum; discus in glandulam posticam magnam glabram emarginatum reductus; placentae intus solum ovuliferae; capsula crassa, ca. 12 mm. longa, bivalvata, valvis explanatis; semina parva, ca. 1.5 mm. longa.

TYPE: Kaieteur Savanna, British Guiana, May 1, 1944, *Maguire & Fanshawe 23127*. New York Botanical Garden.

The present species belongs to the section *Euallopplectus*, which is the dominant section in the Andes but which has not been known previously from the Guianas. There are so many species in the section, most of them undescribed, that the relationship of the present one cannot be determined precisely at present.

CODONANTHE CALCARATA (Miquel) Hanst. *C. bipartita* L. B. Smith. BRITISH GUIANA: frequent epiphytic vine associated with ant nest, corolla white, pink-striped, Kamuni Creek, Groete Creek, Essequibo River, *22838;* soft woody perennial herb growing on ant nests on trees, pendent or creeping along branches, stem with adventitious roots, leaves fleshy, flowers two in each axil of uppermost leaves, perianth whitish, pinkish, or yellowish, with pale crimson dots, Mazaruni Station, Mazaruni River, *F1422*. SURINAM: savanna, Zanderij I, *25050*. Known only from the Guianas.

CODONANTHE CRASSIFOLIA (Focke) Morton. *C. confusa* Sandw. SURINAM: frequent epiphyte in tall trees, Agricultural Experiment station, Paramaribo, *22765*. Occurs from Costa Rica to northern South America.

Columnea guianensis Morton, sp. nov. Herba perennis, procumbens et adsurgens, caulibus non ramosis, usque ad 7 mm. diam., teretibus, striatis, sericeis, demum glabrescentibus; folia opposita, per paria valde inaequalia, majora breviter petiolata, petiolo ca. 1 cm. longo, sericeo, lamina oblanceolata, 20–23 cm. longa. 7–8 cm. lata, apice abrupte at breviter acuminata (1 cm.), basi valde inaequali, margine minutissime denticulata, supra juventute parce sericea, mox glabra, subtus leviter sericea, supra medium vel interdum fere ubique rubra, venis primariis 7–9-jugis, adscendentibus, utrinque paullo elevatis, secundariis obscuris; folia minora stipuliformia, subsessilia, lamina ovato-lanceolata, 1.5–2 cm. longa, 5–8 mm. lata, apice

gradatim argute acuminata, basi valde inaequalia, rotundata, subintegra, viridia, supra subglabra, subtus parce sericea; inflorescentiae axillares, floribus geminis vel ternis, breviter pedunculatis, pedunculo ca. 5 mm. longo, basi bracteas foliaceas paucas gerente; calyx herbaceus, viridis, ca. 2 cm. longus, lobis liberis, planis, erectis, lanceolatis, paullo inaequalibus, postico ca. 4 mm. lato, alteris 5 mm. latis, longe gradatim acuminatis, basi paullo angustatis, perspicue inciso-serratis, serraturis (apice glandulosis) ca. 7 utroque latere (postico ca. 5 utroque latere), intus glabris, externe dense flavido-sericeis; corolla erecta, flava, lobis externe sanguineis, usque ad 30 mm. longa, tubo basi postico paullo gibboso, anguste cylindrico, 4.5–5 mm. diam., externe dense flavido-sericeo, intus parce puberulo, limbo subregulari, lobis inferioribus subdeltoideis, ca. 2 mm. longis et latis, 2 superioribus fere usque ad apicem connatis; filamenta basi 2.5 mm. connata, suberecta, parce pilosula; antherae inclusae, subquadratae, 2 mm. longae et latae, liberae, connectivo parce piloso, loculis discretis; staminodium nullum; ovarium conicum, dense sericeum; stylus inclusis, glaber; stigma bilobum; discus in glandulam posticam glabram crassam emarginatam ca. 1.5 mm. longam reductus.

TYPE: rocky ground in mixed forest, Tukeit, Potaro River Gorge, British Guiana, April 28, 1944, *Maguire & Fanshawe, 23067*. U. S. National Herbarium; New York Botanical Garden.

Apparently related to *Columnea consanguinea* Hanst. of Costa Rica and Panama, which differs chiefly in its entire rather than incised-serrate calyx lobes. Seemingly *Columnea*, which is the largest American genus of Gesneriaceae, has not been known previously from British Guiana.

DRYMONIA CRISTATA Miquel. SURINAM: frequent succulent vine, corolla white, the upper lip yellow-spotted, fruit explanate, scarlet within, seeds minute, black, imbedded in the deliquescing axial material, river banks above Kwatta hede, Saramacca River, *23935*. Known only from Surinam, and to me previously only from description.

EPISCIA CILIOSA (Mart.) Hanst. BRITISH GUIANA: in white sand, Amatuk Portage, *23019*. This species has seemingly been known previously only from the original collection from Manacurú, Japura, District of Rio Negro, Brazil (*Martius* 3117). A photograph of the type in the Munich Herbarium has been distributed by the Chicago Natural History Museum. The species appears to be most closely allied to *Episcia glabra* (Benth.) Hanst. (*Centrosolenia glabra* Benth.) from Venezuela, with which it agrees particularly in the bearded anthers, fimbriate corolla lobes, and narrow, red, toothed calyx segments. However, *E. ciliosa* is a procumbent plant, bearing, at least ordinarily, only a single subapical leaf, whereas *E. glabra* is erect, with several leaves. The leaves are conspicuously appressed-pilose in *E. ciliosa* and, except for the petiole and midrib beneath, glabrous in *E. glabra*. I give below an amplified description.

Terrestrial or epiphytic, the stems thick, procumbent, unbranched, short, 4–5.5 mm. in diameter, red-pilose; leaves solitary, subapical, 25–43 cm. long, petiolate, the base subamplexicaul, the blade oblanceolate, 4.5–8.5 cm. wide, the apex abruptly long-acuminate, long-decurrent at base into the petiole, herbaceous in texture, green above, paler beneath, sharply serrulate, subappressed-pilose on both sides, the primary veins 7–12 pairs, ascending; inflorescences axillary, several-flowered, the common peduncle obsolete,

the pedicels slender, 1–2.5 cm. long, conspicuously red-hirsute, the basal bracts inconspicuous, linear, 3–5 mm. long, red, hirsute; calyx scarlet, the lobes 5, linear-lanceolate, erect, a little unequal, the shorter about 1.3 cm. long in anthesis, the longer about 1.6 cm. long, 2.5–3 mm. broad toward base, free, subulate at apex, remotely denticulate, especially toward the apex, red-pilose externally, glabrous within; corolla white, horizontal in the calyx, about 2.6 cm. long, spurred 1 mm. at base, the tube very narrow and slender at base (about 1 mm. in diameter), abruptly dilated upwardly, becoming 9 mm. wide in the throat, strigillose externally, glabrous within, the limb subbilabiate, the upper lobes fimbriate; stamens conspicuously didynamous, the filaments slender, glabrous, the anthers connate in pairs, about 1.5 mm. long and 1 mm. broad, the cells discrete, coarsely and conspicuously bearded at apex; ovary globose, sericeous; disk reduced to a glabrous, thick, solitary, ovate gland; placentae ovuliferous on the inner surfaces only.

EPISCIA DENSA C. H. Wright. BRITISH GUIANA: undersurface of leaves crimson, procumbent herb rooting at nodes, flowers white or lobes pale purple, locally abundant in woodland at Garraway Stream, Potaro River, *22982;* in white sand, Waratuk Falls, Potaro River Gorge, *23036*. Known only from British Guiana.

EPISCIA HIRSUTA (Benth.) Hanst. BRITISH GUIANA: stoloniferous perennial herb, stems and leaf veins red, flowers white, lobes pale violet, erose, locally frequent (but rarely flowering), in mixed forest, Tukeit, Potaro River Gorge, *23078*. Previously known to me only from description. The type was collected in British Guiana by Schomburgk.

EPISCIA MACULATA Hook. f. BRITISH GUIANA: scandent or closely climbing vine, occasional in *Mora* and mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22826*. Known only from British Guiana.

EPISCIA sp. aff. E. CUNEATA Gleason. BRITISH GUIANA: locally frequent, flowers white, on moist rocks in high mixed forest, Potaro River Gorge, *23520*. Probably undescribed, but a description must be postponed until a complete survey of the genus can be made.

EPISCIA sp. BRITISH GUIANA: Waratuk Falls, Potaro River Gorge, *23047*. This perhaps represents a new species also, but it cannot be described at present.

TUSSACIA RUPESTRIS Benth. SURINAM: succulent perennial herb, locally frequent on exposed, wet, rocky slopes near base of Augustus Falls, at Cataract 3, Tafelberg, *24762*. Previously known only from British Guiana, and to me only from a collection (*A. C. Smith 3579*) from the Kanuku Mountains.

RUBIACEAE[108]

NAUCLEEAE

UNCARIA GUIANENSIS (Aubl.) Gmel. SURINAM: frequent liana, rope to 6 cm. diam., flowers greenish-white, river banks below rapids, Jacob kondre, Saramacca River, *23807*. Venezuela, Trinidad, and Guianas to Brazil and Bolivia.

[108] By Paul C. Standley.

CINCHONEAE

COSMIBUENA GRANDIFLORA (Ruiz & Pavón) Rusby. BRITISH GUIANA: tree to 12 m. high, 10 cm. diam., flowers cream-colored, the corolla lobes flat, spreading, young fruit greenish, occasional to frequent, Kaieteur Savanna, *23226*. Widely distributed in northern and western South America.

COUTAREA HEXANDRA (Jacq.) Schum. SURINAM: shrub to 3 m. high, infrequent, sandy soil, scrub savanna, Charlesburg Rift, 3 km. north of Paramaribo, *22726*. Distributed at suitable elevations almost throughout tropical America.

FERDINANDUSA RUDGEOIDES (Benth.) Hook. f. SURINAM: tree to 20 m., 30 cm. diam., corolla green, the lobes white within, high mixed wallaba forest, km. 7, Camp No. 2, Saramacca River, headwaters *24879*. British Guiana; northern Brazil.

MANETTIA ALBA (Aubl.) Wernham. BRITISH GUIANA: vine, infrequent, along timber trail, high mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22839*. Guianas and northern Brazil.

MANETTIA COCCINEA (Aubl.) Willd. SURINAM: vine, Island Camp, Toekoemoetoe Creek, Saramacca River, *24073*. Generally distributed in tropical America, from Mexico southward.

HENRIQUEZIEAE

HENRIQUEZIA JENMANI Schum. BRITISH GUIANA: tree 15 m. high, 20 cm. diam., from foreshore on sandy silt at or below tide level, rough-barked, with low buttresses or semi-stilt roots, leaves stiff, glaucous beneath, brittle, flowers creamy-white, corolla hairy inside, with crimson lines converging to the center, a ring of white wooly hairs at the mouth of a twist in the tube, crimson inside below the constriction, Bartica Point, Essequibo and Mazaruni River junction, *F847*. Known otherwise from the type, collected along the Mazaruni River, *Jenman 629*.

CONDAMINEAE

CHIMARRHIS CYMOSA Jacq. BRITISH GUIANA: tree 27 m. high, 40 cm. diam., with irregular spreading plank buttresses to 2 meters high, fluted, mixed forest on lateritic soil in rocky places, leaves thin-leathery, flowers white, sweet-scented, stamens white, Groete Creek, lower Essequibo River, *F1249*. Also in Kanuku Mountains; Venezuela; West Indies.

RONDELETIEAE

CHALEPOPHYLLUM GUIANENSE Hook. f. BRITISH GUIANA: shrub 2 m. high, woody below, stems quadrangular, the shoots fleshy, corolla white, salverform, the throat filled with yellow hairs, the tube suffused with reddish, fruit oblong, greenish, suffused with reddish, rare, Kaieteur Plateau, *23169*. Originally described from British Guiana, but without definite locality; also in the Gran Sabana region of Venezuela.

The genus *Chalepophyllum* is a small and interesting one, confined to this general region of northern South America. The only other species are *C. latifolium* Standl. of Mount Duida; *C. speciosum* N. E. Brown of Mount Roraima and Carrao-tepuí, and Ptari-tepuí, Venezuela; and *C. Tatei* Standl., of Mount Duida.

Elaeagia Maguirei Standl., sp. nov. Arbor 15-metralis, trunco 30 cm. diam., ramulis crassulis subteretibus glabris vel glabratis; stipulae deciduae, non visae, basibus persistentibus incrassatis spinuloso-ciliatis; folia modica firme chartacea, petiolo crassiusculo 6–10 mm. longo; lamina late elliptica 11–14.5 cm. longa 6–8 cm. lata, subabrupte acuta, basi cuneato-contracto et ad petiolum decurrens, supra glabra albido-puncticulata, costis prominulis, subtus fere concolor, sat dense albido-puncticulata, primo ut videtur minute puberula, in statu adulto glabrata, costa gracili elevata, nervis lateralibus utroque latere ca. 9 teneris prominentibus arcuatis adscendentibus, venulis prominulis arcte reticulatis; paniculae terminales sessiles magnae multiflorae, basi trichotomae, ramis gracilibus complanatis dense puberulis, repetite ramosis, floribus in cymulas paucifloras aggregatis, sessilibus; calyx cum hypanthio dense puberulus campanulato-obconicus 2 mm. latus truncatus; corolla alba extus glabra, fauce dense lanata, lobis reflexis tubo anguste obconico paullo longioribus; stamina longiexserta, filamentis glabris, antheris ca. 1.2 mm. longis.

TYPE: tree 15 m. high, 30 cm. diam., flowers white, frequent in high forest, alt. 625 m., base of south cliffs, Arrowhead Basin, Tafelberg, Surinam, August 23, 1944, *Maguire 24449*. Chicago Natural History Museum; New York Botanical Garden.

This is the first species of *Elaeagia* to be recorded from Surinam. The species with the nearest range, and the one most closely related, appears to be the Venezuelan *E. Karstenii* Standl. In that the calyx is shallowly but conspicuously lobate, the flowers distinctly larger, and the leaves, which are less acute, not white-puncticulate.

SIPANEA OVALIFOLIA Bremekamp. SURINAM: frequent, flowers white, vicinity of Camp 2, Saramacca River headwaters, *24135*. Frequent herb, flowers pink, opening in high bush, base of north escarpment, Tafelberg, *24314*. Known only from Surinam.

SIPANEA PRATENSIS Aubl. BRITISH GUIANA: flowers pale pink, occasional, sandy or rocky ground, Kaieteur Savannas, *23472*. Widely distributed in northern South America; Trinidad.

MUSSAENDEAE

COCCOCYPSELUM GUIANENSE (Aubl.) Schum. BRITISH GUIANA: repent and prostrate, flowers lilac, fruit deep china-blue, white sand, secondary forest, Waratuk Falls, Potaro River Gorge, *23048*. SURINAM: savanna, vicinity of Sectie O, *25022;* flowers pale blue, fruit dark blue, low forest floor, north of Savanna III, Tafelberg, *24283*. Widely distributed in tropical America.

GONZALAGUNIA SPICATA (Lam.) Gómez. BRITISH GUIANA: shrub to 2 m., flowers white, high forest, Kamuni Creek, Groete Creek, Essequibo River, *22878;* subshrub to 4 m., flowers white, fruit blue, common, banks and swamps along Kamuni Creek, *22926a*. Guianas and Brazil; West Indies.

ISERTIA HYPOLEUCA Benth. BRITISH GUIANA: tree to 10 m. high, 15 cm. diam., flowers red. yellow in the throat, locally frequent; essentially bush island, Kaieteur Savanna, *23132*. SURINAM: frequent, small tree to 10 m., 15 cm. diam., wood soft, flowers scarlet, primary jungle near Posoegronoe, Saramacca River, *24020*. Northern South America, southward to Peru.

ISERTIA PARVIFLORA Vahl. SURINAM: infrequent, tree to 12 m., flowers pink, the calyx red, river banks below rapids, Jacob kondre, Saramacca River, *23825*. Venezuela and Guianas; West Indies.

SABICEA ASPERA Aubl. BRITISH GUIANA: vine on low shrubs, stems reddish, flowers white, fruit dull crimson, Garroway Stream, Potaro River, *22957*. Guianas; northern Brazil.

SABICEA GLABRASCENS Benth. var. OBLONGIFOLIA (Miq.) Sandw. BRITISH GUIANA: vine, frequent to common, along timber trail, high mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22841*. SURINAM: frequent vine, flowers white, along railroad Sectie O, near km. 70, *23610;* frequent, divaricately branched, flowers white, fruit light blue, below rapids, Jacob kondre, Saramacca River, *23884*. Guianas; Amazonian Brazil; reported from Venezuela.

Schradera surinamensis Standl., sp. nov. Frutex scandens glaber, ramis crassis fusco-brunneis vel cinnamomeis, subteretibus; stipulae fusco-brunneae deciduae subvaginantes ca. 17 mm. longae, apice rotundatae vel obtusae; folia in sicco fuscescentia subcoriacea, petiolo crasso 13–20 mm. longo; lamina ovali-elliptica vel late oblongo-elliptica 10–16 cm. longa 5–8 cm. lata, late acuta vel subacuta, basi rotundata usque subacuta et saepe abrupte breviter decurrens, concolor, costa supra impressa, subtus prominenti, nervis lateralibus obscuris utroque latere ca. 11 tenerrimis angulo latiore quam recto abeuntibus fere rectis, prope marginem inaequaliter conjunctis; capitula terminalia dense multiflora 2 cm. lata vel paullo ultra, involucro ca. 12 mm. alto irregulariter breviterque lobato vel subintegro, pedunculo crasso 6–10 cm. longo; calyx brevis truncatus, limbo ca. 5 mm. latus.

TYPE: vine, scandent subshrub, flowers white, frequent in high forest, east facing slopes above escarpment, 300 m. south of East Ridge, Tafelberg, Surinam, August 29, 1944, *Maguire 24554*. Chicago Natural History Museum; New York Botanical Garden. Vine forming dense masses, flowers white, frequent, base of north escarpment, Tafelberg, *24323*.

This is the first member of the genus to be reported from Surinam. Until recently few specimens of *Schradera* have been collected in South America, but those now coming to hand in greater numbers indicate that the genus is represented there by a rather large number of only slightly different but apparently well marked species. The present one is conspicuously different from *S. polycephala* DC. of French and British Guiana, which has much smaller and relatively much narrower leaves, very obtuse or even narrowly rounded at the apex.

HAMELIEAE

BERTIERA GUIANENSIS Aubl. BRITISH GUIANA: shrub 2 m. high, mixed forest, flowers white, fruit pale china-blue, Takutu Creek to Puruni River, Mazaruni River, *F2182*. SURINAM: bush to rear of Jacob kondre, Saramacca River, *23755a*. Southern Mexico to Brazil and Bolivia.

BERTIERA sp. SURINAM: perennial herb with pink flowers, locally frequent in opening, base of north escarpment, Tafelberg, *24774*.

GARDENIEAE

ALIBERTIA TRIFLORA (A. Rich.) Schum. SURINAM: small tree to shrub,

flowers white, scentless, bush to rear of village of Jacob kondre, Saramacca River, *23858*. Surinam and French Guiana.

AMAIOUA CORYMBOSA HBK. SURINAM: frequent, small tree, flowers white, mixed wallaba forest, km. 23, Tafelberg, *24819*. Species new for Surinam; Guianas; Cuba; Central America.

AMAIOUA GUIANENSIS Aubl. BRITISH GUIANA: tree to 12 m., 15 cm. diameter, occasional to frequent, mixed forest, banks and swamp along Kamuni Creek, Essequibo River, *22930*. Venezuela and Guianas; widely distributed in Brazil.

DUROIA ERIOPILA L. f. BRITISH GUIANA: frequent, tree to 20 m. high, 20 cm. diameter, not buttressed, white sand, *Dicymbe* forest, immature fruit oblong-globose, as much as 7 cm. long and 6 cm. broad, greenish brown, mixed forest, Tukeit, Potaro River Gorge, *23051*.

DUROIA GENIPOIDES Hook. f. *D. Sprucei* Rusby. BRITISH GUIANA: tree 20 m. tall, 30 cm. diam., mixed forest on brown sand, leaves crowded at ends of branches, leathery, fruits terminal, solitary, globose, green and glossy, turning reddish brown when ripe, the flesh granular, edible, Mazaruni Station, *F1973*. SURINAM: tree 10 m. high, 15 cm. diam., corolla lobes creamy white, frequent, medium forest, between Savanna IV and V, Tafelberg, *24393;* tree 12 m. high, 15 cm. diam., flowers white, frequent, high mixed forest, south rim of Arrowhead Basin, Tafelberg, *24646*. Venezuela; Guianas; northern Brazil.

GENIPA AMERICANA L. BRITISH GUIANA: tree 6–8 m. high, 10–15 cm. diam., the branches spreading, leaves crowded at ends of branches, fruit globose, brown, edible, locally frequent, river side above Kaieteur Falls, *23369;* shrub or bushy tree of riverside vegetation, usually growing in the water, leaves thin-leathery, flowers white, anthers green, flowers turn yellow as they wither, Mazaruni River, *F2014*, vernacular name *Lana*. SURINAM: frequent tree, Grasi Falls, Saramacca River, *24937;* frequent, tree to 12 m. high, 30 cm. diam., flowers white, overhanging Tafelberg Creek, km. 5, *24893;* frequent, tree to 15 m. high, 8 cm. diam., dark pigment of fruit used by Carib Alasary, river banks below rapids, Jacob kondre, Saramacca River, *23835*. Widely distributed in tropical America.

POSOQUERIA LONGIFLORA Aubl. BRITISH GUIANA: tree 4 m. high, 3 cm. diam., hollow-stemmed, occasional, base Kaieteur escarpment below Tukeit, Potaro River, *23494;* slender tree 5–7 m. high, 5 cm. diameter, occasional, banks and swamp along Kamuni Creek, Essequibo River, *22936*. SURINAM: frequent, slender shrub or small tree hanging over river, one hour above Brokoboto Rapids, *23982;* frequent, arching shrub or small tree, flowers white, fruit white specked with green, yellow when mature, river banks above village of Kwatta hede, Saramacca River, *23928*. Guianas; northern Brazil and eastern Peru.

RANDIA ARMATA (Sw.) DC. BRITISH GUIANA: rope with tough gray skin, two inches diam. from mixed forest by creek, leaves paired, clustered at apex of short shoots, herbaceous, flowers white, hairy, calyx green, Mazaruni Station, *F917*.

RETINIPHYLLEAE

RETINIPHYLLUM LAXIFLORUM (Benth.) N. E. Brown. SURINAM, TAFELBERG: shrub to 3 m. high, flowers red, frequent, Savanna VII, *24439;*

shrub to 3 m. high, flowers red, fruit black, juicy, frequent, Savanna VII, *24786;* flowers deep pink or red, frequent, damp shaded walls, gorge above Lisa Falls, *24373;* frequent, flowers coral-red, Savanna I, *24220;* frequent, flowers deep pink or red, Savanna IV, *24373.* New for Surinam; also on Mount Roraima (Brazil, Venezuela, British Guiana).

Retiniphyllum Maguirei Standl., sp. (hybrid.?) nov. Frutex, ramulis subgracilibus, nodosis, nodis plerumque brevibus, breviter hispidulis; tubus stipularis fere 2 mm. longus puberulus; folia coriacea in sicco sublucida, petiolo 7–19 mm. longo breviter hispidulo; lamina elliptico-oblonga 4.5–6 cm. longa 2–3 cm. lata, obtusa, basi acuta, supra glabra, subtus paullo pallidior brunnescens sparse minute scaberula tactu asperula; flores racemosi, racemis usque ad 7 cm. longis, breviter pedunculatis, sparse paucifloris, rare ramosis, rhachi glabra vel glabrata, pedicellis oppositis vel interdum alternis 3–5 mm. longis crassiusculis sparse minuteque scaberulis; ovarium cum calyce 6–7 mm. longum glabrum, calyce tubuloso, apice 2.5 mm. lato truncato; corolla extus intusque dense albido-sericea, tubo 9–10 mm. longo, lobis patentibus vel reflexis late linearibus tubo paullo longioribus; genitalia longe exserta lobos corollae subaequantia.

TYPE: shrub to 3 m., flowers pink, frequent, Savanna IV, alt. 552 m., Tafelberg, Surinam, August 15, 1944, *Maguire 24374.* Chicago Natural History Museum; New York Botanical Garden. Shrub to 3 m., flowers coral-red, frequent, Savanna I, Tafelberg, *24220.*

The plant represented by these two collections is believed by Dr. Maguire to be possibly a hybrid between *R. laxiflorum* and *R. Schomburgkii,* and this hypothesis seems highly probable to the writer. The leaves are similar to those of *R. Schomburgkii,* but have rather less abundant pubescence; the leaves of *R. laxiflorum* are glabrous. The pedicels are much shorter than those of *R. laxiflorum;* the flowers of *R. Schomburgkii* are sessile. The calyx is glabrous and truncate as in *R. laxiflorum,* that of *R. Schomburgkii* being pubescent and conspicuously dentate. The shape of the corolla is like that of *R. Schomburgkii.* It is thus evident that the characters of *R. Maguirei* are intermediate between those of the putative parents, and a combination of them. All three of the species listed here, of course, grow on the same mountain.

RETINIPHYLLUM SCHOMBURGKII (Benth.) Muell. Arg. BRITISH GUIANA: shrub, 1 m. high, flowers whitish, the corolla lobes reflexed, fruit crimson, occasional, bush island, Kaieteur Savannas, *23168.* SURINAM: shrub to 2 m., savanna vicinity of Sectie O, *25014;* shrub to 2 m., corolla white, the lobes pink at the base, south savannas, vicinity of Arawak village, Mata, Zanderij I, *24985;* shrub to 3 m., corolla lobes pink or white with pink base, fruit 4 m., black, frequent, Savanna VII, Tafelberg, *24787; 24788;* shrub to 4 m., flowers red, frequent, Savanna I, Tafelberg, *24361;* frequent, Savanna IV, Tafelberg, *24372; 24374a.* Venezuela; Guianas; northern Brazil.

GUETTARDEAE

CHOMELIA TENUIFLORA Benth. SURINAM: infrequent, widely spreading, small tree 3 m. tall, 7 cm. diam., flowers white, spines sometimes 6–8 cm. long, bush to rear of Jacob kondre, Saramacca River, *23846.* British Guiana; Venezuela.

MALANEA ANGUSTIFOLIA Bartling. BRITISH GUIANA: stems 3 cm. diam.,

inflorescence and calyx green, fruit purple-black, along Potaro River below Tukeit, *23500*. Confined to British Guiana; originally collected by Schomburgk along the Demerara River; upper Mazaruni River, *Pinkus 218*.

This species, so far as the writer knows, never has been properly described and published.

MALANEA MACROPHYLLA Bartling. SURINAM: frequent, rope in low open bush, vicinity of Savanna IX, Tafelberg, *24648;* scandent shrub or vine, flowers white, frequent, Savanna VIII, Tafelberg, *24530*. Guianas; Venezuela; northern Brazil.

MALANEA SARMENTOSA Aubl. SURINAM: vine, leaves tawny-red, strongly rugose, wallaba forest, km. 7, Saramacca River Headwaters, *24874*. Guianas; Venezuela; northern Brazil.

IXOREAE

Ixora mazarunensis Standl., sp. nov. Frutex, praeter inflorescentiam fere omnino glaber, ramulis subteretibus gracilibus, internodiis elongatis; stipulae bene evolutae non visae, in tubum brevem coalitae, lobis brevibus latisque 1-costatis, apice acuminato-apiculatis; folia majuscula firme chartacea glabra, petiolo 1–1.5 cm. longo; lamina anguste elliptico-oblonga 16–17 cm. longa 5–5.5 cm. lata, abrupte acuminata, basi acuta vel attenuato-acuta, subtus paullo pallidior brunnescens, nervis lateralibus utroque latere ca. 9 tenerromis subtus prominulis, arcuatis, venis obsoletis; inflorescentia terminalis breviter pedunculata capituli-formis, pedicellis crassis dense pubescentibus usque ad 3 mm. longis sed vulgo brevioribus vel nullis, bracteis majusculis saepe calycem subinvolventibus; calyx late campanulatus dense puberulus, margine remote breviter dentato; corolla in alabastro 15 mm. longa extus subsparse puberula, tubo gracili lobis paullo longiore; fructus ovalis glabratus in sicco 8 mm. longus, basi rotundatus.

TYPE: shrub of *Mora* forest, to 2 m. tall; leaves leathery, pale beneath, buds red, fruit red, fleshy, Takutu Creek to Puruni River, British Guiana, November 7, 1944. *Fanshawe 2079* (*F.D. 4815*). New York Botanical Garden; photograph at Chicago Natural History Museum.

It is most unsatisfactory to describe new species in this genus, in which most of the known species appear to be poorly marked, and at best are poorly understood. Very few species have been described from the Guianas, in contrast with Brazil, and the present plant does not fall satisfactorily into any of them. It resembles *I. xantholoba* Standl., of the same general region, but in that the flowers are glabrous, and the corolla lobes scarcely half as long as the tube.

IXORA ORINOCENSIS Spruce. SURINAM. TAFELBERG: tree 12 m. high, 15 cm. diam., flowers yellow, turning orange, frequent, rim of Arrowhead Basin, *24475;* tree 10 m. high, 10 cm. diam., low bush 1.5 km. west of Savanna IV, *24413;* small tree 8 m. high, 10 cm. diam., flowers yellow, turning orange-red, frequent, low forest north of Savanna III, *24282*. The type is from Maipures on the Río Orinoco, Venezuela.

The species is new for Surinam. Here may belong also the following collection from British Guiana: Kaieteur Savanna, *23397;* a tree 4 m. high, 3 cm. diam., fruit green tinged with red, rare in low bush. At first this was believed to represent a new species, but the specimen is in fruit only, and it is believed better for the present to refer it with question to *I. orinocensis*.

IXORA XANTHOLOBA Standl. BRITISH GUIANA: shrub a meter high, or sometimes 4.5 m. tall, with habit of tree sapling, mixed forest on loamy soil, leaves thinly leathery, corolla tube pink, the limb rotate, yellow, the lobes slightly revolute, Takutu Creek to Puruni River, Mazaruni River, *F2016*. Known otherwise only from the type, from Twasinki, basin of Essequibo River.

COUSSAREAE

COUSSAREA PANICULATA (Vahl) Standl. BRITISH GUIANA: tree 9 m. high, 10 cm. diam., sometimes as much as 24 m. high, and diameter of 30 cm., inner bark discoloring to blue-green rapidly on exposure to air, flowers white, fleshy, the corolla lobes revolute, buds creamy, *Dicymbe* forest, trail from Tukeit to Kaieteur Falls, Potaro River Gorge, *23072;* tree 12 m. high, 15 cm. diam., yaru-amara forest on light brown sand, leaves thinly leathery, Ituni Road, Mackenzie, Demerara River, *F2498*. SURINAM: small tree, flowers white, leaves turned downward, fruit apparently white, Campo Dungeoman, Saramacca River, *24046;* small tree to 4 m., fruit white, 10 km. below confluence of Toekoemoetoe Creek with Saramacca River, *24057*. Venezuela; French Guiana; Trinidad.

COUSSAREA RACEMOSA A. Rich. SURINAM: tree to 12 m. high, 12 cm. diam., flowers white, frequent, high mixed forest, base of north escarpment, Tafelberg, *24299*. Also in French Guiana.

COUSSAREA SURINAMENSIS Bremekamp. SURINAM: tree 10 m. high, 10 cm. diam., high mixed wallaba forest, lateritic soil, km. 9.5, Coppenam River Headwaters, *24861*. Known previously only from the type, collected by Focke but without definite locality.

FARAMEA CAPILLIPES Muell. Arg. BRITISH GUIANA: shrub 2 m. high with horizontal branching, morabukea forest, leaves chartaceous, brittle like tinfoil, corollas greenish white, the lobes thick, revolute, Takutu Creek to Puruni River, Mazaruni River, *F2019;* erect shrub to 2.5 m. tall, same locality, *F2032*. SURINAM: frequent shrub or small tree to 4 m., high bush, base of north escarpment, Tafelberg, *24343;* frequent shrub to 3 m., flowers white, mixed high forest, same locality, *24776;* subshrub, fruit blue, low forest, between Camps 3 and 4, km. 15, Coppenam River Headwaters, *24156*. Guianas; Venezuela; northern Brazil, eastern Colombia and Peru.

The species has not been reported previously from Surinam, but the description of *F. quadricostata* Bremekamp suggests this species.

FARAMEA LONGIFOLIA Benth. BRITISH GUIANA: shrub 2 m. high, growing from rocks in falls, stems and leaves brittle, leaves stiff, at all angles from the stem, buds pale purple, Takutu Creek to Puruni River, Mazaruni River, *F2172*. SURINAM: infrequent small tree, the twigs green, flattened, leaves chartaceous, river banks below rapids, Jacob kondre, Saramacca River, *23831*. British Guiana; northern Brazil.

FARAMEA SALICIFOLIA Presl. SURINAM: small tree, fruit yellow, Tafelberg Creek, 5–10 km. below base camp, *24080*. Guianas; Venezuela and Colombia to northern Brazil and Bolivia.

PSYCHOTRIEAE

CEPHAELIS ALTSONI Sandwith. BRITISH GUIANA: perennial herb, leaves leathery, flowers white, the corolla lobes yellow within, bracts of the in-

florescence white, waxy, rare to occasional, white sand, secondary scrub forest, Amatuk Portage, Potaro River Gorge, *23018*. The type is from Macreba Falls, Kurupung River, Mazaruni River, and is described as a shrub of 1.5–3 m., collected at the type locality also by *Pinkus, no. 5*.

CEPHAELIS BARCELLANA (Muell. Arg.) Standl. BRITISH GUIANA: perennial semi-woody herb or subshrub of clearings in the forest, to 2 m. high, branched, bracts of the inflorescence scarlet, spreading, flowers pale yellow, Takutu Creek to Puruni River, Mazaruni River, *F2040;* local name Sailor's hat. Colombia and Venezuela to northern Brazil and eastern Peru.

Not reported previously from British Guiana. The plant is exactly like *C. tomentosa*, except that the long hairs of the lower leaf surface are closely appressed to the nerves, rather that spreading widely from them. Although considered a distinct species by Mueller, it is questionable whether the form is really essentially different from *C. tomentosa*.

CEPHAELIS CALLITHRIX Miq. *Gamotopea callithrix* Bremekamp. BRITISH GUIANA: subshrub a meter tall, all parts with blackish hairs, Morabukea forest, flowers white, Takutu Creek to Puruni River, Mazaruni River, *F2020*. SURINAM: perennial herb, flowers white, opening in high forest, base of north escarpment, Tafelberg, *24311;* divaricately branched, fruit light blue, swampy bush above village, along Saramacca Trail, Jacob kondre, *23884*. Guianas; northern Brazil, Trinidad.

Cephaelis Fanshawei Standl., sp. nov. Arbuscula, ramulis gracilibus teretibus, dense pilis longis laxis patentibus villoso-pilosis; folia elliptica vel anguste elliptica, petiolis 8 mm. longis vel brevioribus, dense patenti-pilosis; lamina 7.5–9.5 cm. longa, 3–4 cm. lata, breviter acuminata, basi acuta, utrinque pilis longis laxis patentibus mollibus conspersa, subtus paullo pallidior; inflorescentiae terminales breviter pedunculatae eis speciei *C. potaroensis* Sandw. similes; bracteae exteriores coccineae, ellipticoovales, ca. 3 cm. longae atque 1.5 cm. latae, obtusae vel subacutae, extus pilis longis albis laxis patentibus conspersae.

TYPE: soft-wooded tree 4 m. high, 2 cm. diam., flowers white, bracts scarlet, occasional, from wallaba forest, Kaieteur Savanna, British Guiana, May 8, 1944, *Maguire & Fanshawe 23296*. Chicago Natural History Museum; New York Botanical Garden.

In general appearance and in most of its characters this is like *C. potaroensis* Sandwith (Hook. Icon. *pl. 3300*. 1935), which is described and discussed by its author in great detail. That differs from *C. Fanshawei* in having the pubescence of the leaves and bracts of closely appressed hairs; its floral bracts are orange at first, turning dull dark red in age, and are acute or acuminate.

CEPHAELIS KAPPLERI (Miq.) Benoist. SURINAM: swampy bush above village along Saramacca Trail, Jacob kondre, *23881*. Apparently a rare species, only two collections, including the type, being reported in the *Flora of Surinam;* also in French Guiana.

CEPHAELIS POTAROENSIS Sandwith. BRITISH GUIANA: shrub, lax, dichotomously branched, flowers creamy, the calyx yellow, bracts orange, fruit oblong to globose, deep blue, Garroway Stream, Potaro River, *22966*. Known only from British Guiana, where it is rather widely distributed.

CEPHAELIS PUBESCENS Hoffmannsegg. BRITISH GUIANA: shrubby, 2 m.

high, bracts mauve-pink, fruit blue, seeds blue, occasional, riverside, above Kaieteur Falls, *23362*. SURINAM: frequent on rocky north slopes of Tafelberg, *25065;* frequent, shrub to 2 m., bracts deep purple, fruit blue, trail to Coppenam River to rear of Pakka Pakka, *23981*. Colombia and Venezuela; Guianas; northern Brazil; Trinidad.

CEPHAELIS TATEI Standl. *Psychotria crocochlamys* Sandw. Kew Bull. **1939**: 555. BRITISH GUIANA: subshrub to 1 m. high, bracts red-purple, rare, *Dicymbe* forest, Kaieteur Savanna, *23286*. Type from Mount Roraima; collected in British Guiana also on Membaru Creek, upper Mazaruni River; and in Venezuela on Ptari-tepui.

CEPHAELIS TOMENTOSA (Aubl.) Vahl. BRITISH GUIANA: perennial herb to 1 m. high, fruit 1.5 cm. long, obpyriform, pale blue, seeds dark blue, bracts scarlet, revolute, *Dicymbe* forest, riverside above Kaieteur Falls, *23376*. SURINAM: frequent, subshrub to 1 m., bracts orange-red, flowers cream, fruit light blue, savanna bush, along railroad, Sectie O, near km. 70, *23606;* frequent, Island Camp, Toekoemoetoe Creek, Saramacca River, *24074;* shrub to 2 m. high, flowers yellow, bracts bright orange-red, high forest, boulder stream talus, base of west escarpment, Tafelberg, *27200*. Generally distributed in wet lowlands of tropical America.

This is one of the most abundant, or at least one of the most often collected, Rubiaceae of tropical America, attracting attention because of its large and brightly colored inflorescence. The writer, from his own field experience with this rather weedy plant, is inclined to believe that it makes a handsomer showing in herbarium specimens than it does in the field.

CEPHAELIS VIOLACEA (Aubl.) Swartz. BRITISH GUIANA: subshrub to 2 m. tall, loosely branched, mixed forest on heavier soils, leaves stiff and brittle, branchlets, peduncles, and bracts blackish, fruit purple-black when ripe, Makauria Creek, *F698*. SURINAM: frequent subshrub, to 1.5 m. high, flowers white, montane forest, Krappa Camp (No. 2), Saramacca River Headwaters, *24145;* frequent, shrub to 1.5 m., fruit blue, secondary bush, Zanderij II, *23706*. Colombia and Venezuela; Guianas, northern Brazil.

GEOPHILA CORDIFOLIA Miq. SURINAM: frequent, repent herb, above village of Jacob kondre, along Saramacca Trail, *23870a*. Guianas; northern Brazil.

GEOPHILA HERBACEA (L.) Schum. SURINAM: common in deep shade, secondary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22789*. Generally distributed in the lowlands of tropical America.

PAGAMEA CAPITATA Benth. BRITISH GUIANA: tree 3 m. high, the trunk 10 cm. in diameter, leaves crowded at ends of branches, flowers greenish white, young fruit suffused with red, occasional to frequent, Kaieteur Plateau, *23185;* occasional to frequent, 3 m. high, 10 cm. diam., flowers greenish white, from bush island, Kaieteur Plateau, *23281*. SURINAM: common, shrub to 4 m., flowers white, fruit reddish, Savanna II, Tafelberg, *24252;* common, shrub to 5 m., 10 cm. diam., fruit red, Savanna I, Tafelberg, *24740*. Also in Venezuela.

The genus *Pagamea* probably is more accurately referable to Loganiaceae than to Rubiaceae, although it is referred to the latter family by various authors, and is treated here as a matter of convenience. The plants certainly have much in common with the Rubiaceae, if they are not actually referable there.

PAGAMEA GUIANENSIS Aubl. BRITISH GUIANA: tree to 3 m. high, with whorled branching, 10 cm. diam., flowers white, young fruit green suffused with red, glossy, occasional, bush island, Kaieteur Savannas, *23155*. SURINAM: rare, shrub to 4 m. high, savanna, Zanderij I, *23736a*. Venezuela; Guianas; rather widely distributed in Brazil.

PALICOUREA CROCEA (Sw.) DC. BRITISH GUIANA: shrub to 4 m., flowers lemon-yellow, inflorescence crimson in flower, mauve in fruit, ripe fruit black, locally frequent, inundated land, riverside above Kaieteur Falls, vicinity of Savanna I, Tafelberg, *24356;* shrub to 2 m. high, inflorescence bright coral in flower, purple in fruit, frequent, openings in low forest, vicinity of Savanna I, Tafelberg, *24356;* shrub to 2 m. high, inflorescence purple, frequent, high mixed forest, south rocky slopes, Arrowhead Basin, Tafelberg, *24612*. Widely distributed in tropical America, from Central America to Brazil and Bolivia.

PALICOUREA GUIANENSIS Aubl. BRITISH GUIANA: small tree 10 m. high, common, openings, *Mora* forests, Kamuni Creek, Groete Creek, Essequibo River, *22817*. SURINAM: tree 12 m. high, 15 cm. diam., bush to rear of Jacob kondre, Saramacca River, *23762* (referable to var. *trimera* Bremekamp). Central America; widely distributed in the wet lowlands of South America.

PALICOUREA NICOTIANIFOLIA Cham. & Schlecht. SURINAM: small tree to 5 m., 6 cm. diam., trail to Coppenam River to rear Pakka Pakka, *23976*. Brazil; reported from Colombia.

PSYCHOTRIA ASTRELLANTHA Wernham. *Chytropsia astrellantha* Bremekamp. BRITISH GUIANA: shrub of lax spreading growth, to 1 m. tall, *Mora* forest in damp places, young fruit reddish green, oval, with pale ribs, ripe fruit scarlet, Takutu Creek to Puruni River, Mazaruni River, *F2027*. SURINAM: frequent subshrub, flowers white, fruit red, low forest, line beyond Camp 4, Coppenam River Headwaters, *24165;* flowers greenish, infrequent, high mixed forest, base of north escarpment, Tafelberg, *24775;* frequent subshrub, flowers creamy, the buds orange, woodland, Base Camp, Tafelberg Creek, Saramacca River, *24891;* dense wallaba forest, Base Camp, *24088*. Known only from Surinam and British Guiana.

PSYCHOTRIA BARBIFLORA DC. BRITISH GUIANA: banks and swamp along Kamuni Creek, Essequibo River, *22933;* subshrub to 60 cm. high, with brittle stems and leaves, fruit purple when ripe, bracts purplish green, locally frequent, Kaieteur Savanna, *23340*. Venezuela; Guianas; Brazil; Trinidad.

PSYCHOTRIA CAPITATA Ruiz & Pavón. BRITISH GUIANA: subshrub to 2 m. high, fruit purple-black, Garroway Stream, Potaro River, *22961; 22959* from the same locality; lax, dichotomously branched shrub to 4 m. high, flowers white, plant brittle, shrub a meter high, of loose spreading habit, Morabukea forest, fruit greenish black, Takutu Creek to Puruni River, Mazaruni River, *F2037*. Central America southward to Bolivia; reported from British Guiana previously under the name *P. inundata* Benth.

PSYCHOTRIA CHIONANTHA (DC.) Britton. *Mapouria chionantha* Muell. Arg. SURINAM: small tree, river side en route to Pakka Pakka, Saramacca River, *23964;* shrub to 2 m. high, flowers white, frequent, Charlesburg Rift, 3 km. north of Paramaribo, *22761*. Guianas; Brazil.

PSYCHOTRIA CHLORANTHA Benth. BRITISH GUIANA: shrub 2–3 m. high, leaves fleshy, fruit crimson, inflorescence pale crimson, bush island, Kaieteur

Savanna, *23193*. SURINAM: infrequent shrub to 3 m. high, savanna, Zanderij I, *23729;* subshrub, inflorescence white in flower, purple in fruit, flowers purple, fruit dark purple, stems subsucculent, frequent, high forest, south base escarpment, Arrowhead Basin, Tafelberg, *24518*. Not reported previously from Surinam; also in Venezuela.

PSYCHOTRIA CUSPIDATA Bredem. BRITISH GUIANA: subshrub to 1 m. tall, from undergrowth of a rubber plantation on lateritic gravelly soil, flowers white, the corolla lobes revolute, fruit purple-black when ripe, Mabaruma, Aruka River, N. W. D., *F2357*. SURINAM: frequent shrub, to 4 m. high, flowers cream, fruit bilobate, light blue, pedicels red, primary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22799;* thickets, low bush bordered by *Montrichardia*, Lower Saramacca River, vicinity of Tawa Creek, *23751;* locally common, banks of Toekoemoetoe Creek, Saramacca River, *24905;* frequent, divaricately branched, in dense swampy bush above village along Saramacca Trail, Jacob kondre, *23875*. Southern Mexico to Trinidad, Brazil, and Peru.

PSYCHOTRIA DICHOTOMA (Rudge) Bremekamp. *Cephaelis dichotoma* Rudge. BRITISH GUIANA: occasional to frequent, subshrub to 60 cm. high, the leaves brittle, flower heads nodding, bracts purplish, the corollas pink, fruit dark blue, white sand, secondary forest, Waratuk Falls, Potaro River Gorge, *23040;* subshrub 1.5 m. high, of lax growth, young fruits greenish blue, the bracts purple, glossy, occasional, Kaieteur Savanna, *23255*. SURINAM: frequent subshrub, bracts and peduncles purple, corolla deep purple, low forest, between Camps 3 and 4, Coppenam River Headwaters, *24157*. Guianas; northern Brazil.

I am placing this species under *Psychotria* because it is so treated by Bremekamp in the *Flora of Surinam;* personally I believe it may be treated better as a species of *Cephaelis*, as was done by Rudge.

PSYCHOTRIA ERECTA (Aubl.) Standl. & Steyerm. *Ronabea erecta* Aubl.; *R. latifolia* Aubl.; *Psychotria axillaris* Willd. SURINAM: shrub to 7 m. high, flowers white, frequent in low forest, 1 km. south of Savanna I, Tafelberg. *24357*. Central America to Trinidad, Brazil, and Bolivia.

PSYCHOTRIA KAIETEURENSIS Sandw. BRITISH GUIANA: shrub 2 m. high, leaves brittle, fruit (immature) green, globose, inflorescence sometimes mauve, occasional to frequent in *Dicymbe* forest, trail from Kaieteur to Tukeit, *23475*. Known only from the type locality.

I am unable to suggest any clear relatives of this plant, but it appears to be a well-marked species, noteworthy for the large, abruptly acuminate leaves, yellow-green when dried, and for the very broad and strongly compressed panicle branches.

PSYCHOTRIA FOCKEANA Miq. *Mapouria Fockeana* Bremekamp. BRITISH GUIANA: low second-growth tree with spreading branches from forest edge, flowers white, calyx pale yellow, fruit orange-red, Mazaruni Station, *F1235;* vernacular name *Kamadan*. SURINAM: shrub to 3 m., mature fruit red-orange, swamps dominated by *Cyclanthus* and *Euterpe*, 1 km. southwest of Base Camp, Tafelberg Creek, *24089;* frequent, shrub to 3 m., scrub and secondary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22773*. Known only from Surinam and British Guiana.

PSYCHOTRIA LUPULINA Benth. BRITISH GUIANA: subshrub 1 m. high, laxly branched, brittle-stemmed, inundated areas in *Mora* forest, bracts pale

green, corollas white, anthers rose-pink, Takutu Creek to Puruni River, Mazaruni River, *F2007*. Colombia to the Guianas, Brazil and Bolivia.

Psychotria Maguirei Standl., sp. nov. Frutex 3-metralis, omnino glaber, ramis gracilibus, subteretibus vel in statu juvenili subcompressis, internodis plerumque elongatis; stipulae ad apicem tantum ramuli persistentes, ceterae deciduae, late lanceolato-lineares, ca. 12 mm. longae et 2.5–3 mm. latae (perfecte evolutae non visae), arcte striatae, rigidae, pallidae; folia majuscula, crasse membranacea, breviter petiolata, in sicco fusco-viridescentia, petiolo 12–17 mm. longo; lamina oblanceolata-oblonga vel oblongo-elliptica, 14–21 cm. longa, 5–8.5 cm. lata, subabrupte longeque angusto-acuminata, basi acuta vel saepe attenuato-acuta, nervis supra in sicco prominulis, subtus paullo pallidior, costa gracili elevata, nervis lateralibus utroque latere ca. 9, arcuatis, angulo fere recto vel angustiore adscendentibus, teneris, prominentibus; inflorescentia terminalis vel serius ob axem elongatum lateralis, cymoso-corymbosa, longipedunculata, 3–6 cm. longa, 4–7 cm. lata, erecta, pauciflora, ramis basalibus 2–3 adscendentibus, basi ut videtur non bracteatis, crassis, superne pauciramosis, floribus sessilibus subcapitato-congestis; flores non visi; fructus bicarpellatus intense caeruleus subdidymus, ca. 8 mm. altus atque 12 mm. latus, apice breviter bilobus, basi late rotundatus, pyrenis 5–6 mm. longis dorso laevibus, facie interiore planis.

TYPE: a shrub 3 m. high, fruit dark blue, from montane forest, line beyong Camp 4, Coppenam River Headwaters, Surinam, July 24, 1944, *Maguire 24169*. Chicago Natural History Museum; New York Botanical Garden.

I am quite unable to suggest a definite relationship for this species, which is in fruit only, and has no particularly outstanding characters. The form of the stipules is somewhat puzzling, since all are deciduous except those at the ends of the branchlets, but the plant is not referable to the subgenus *Mapouria*, which is distinguished by deciduous stipules. The somewhat didymous fruit is distinctive, but much larger than in other Psychotrias having that type of fruit.

PSYCHOTRIA MAPOURIA Roem. & Schult. BRITISH GUIANA: tree 3–4 m. high, 6 cm. diam., flowers greenish white, frequent, bush island, Kaieteur Savanna, *23133*. British and French Guiana; northern Brazil.

PSYCHOTRIA OFFICINALIS (Aubl.) Raeusch. *P. involucrata* Swartz; *P. Hoffmannseggiana* Muell. Arg. SURINAM: frequent, open subshrub to 1.5 m. high, divaricately branched, peduncles and bracts purple, fruit white at maturity, dense bush above Jacob kondre along Saramacca trail, Saramacca River, *23874*. Southern Mexico to Trinidad, Brazil, and Bolivia.

PSYCHOTRIA BOSTRYCHOTHYRSUS Sandw. BRITISH GUIANA: shrub to 2.5 m., the stems 3 cm. in diameter, corolla white, the lobes reflexed, occasional, rocky *Dicymbe* forest, trail from Tukeit to Kaieteur, Potaro River gorge, *23073;* subshrub of mixed and greenheart forest, pedicels mauve, buds faintly yellow, corolla pink, fruit purple-black when ripe, Mazaruni Station, *F532*. SURINAM: frequent, slender, divaricately branched shrub or small tree, the twigs green, wallaba forest and pina swamps, Base Camp, Tafelberg Creek, Saramacca River, *24111a;* also *24111a* from same locality. Previously known only from British Guiana.

PSYCHOTRIA PATENS Swartz. BRITISH GUIANA: low shrub, dense thickets, heavy *Mora* forest, Kamuni Creek, Groete Creek, Essequibo River, *22868*.

SURINAM: fruit light purple, Saramacca River banks, en route to Kwatta hede, *23952*. Southern Mexico to the West Indies, Brazil and Bolivia.

PSYCHOTRIA RACEMOSA (Aubl.) Raeusch. *Nonatelia racemosa* Aubl. BRITISH GUIANA: shrub a meter high, lax spreading habit, moist *Mora* forest, fruit orange-scarlet, Takutu Creek to Puruni River, Mazaruni River, *F2038*. SURINAM: occasional, fruit orange-red, low bush bordered by *Montrichardia*, Lower Saramacca River, vicinity Tawa Creek, *23750;* frequent, fruit red, dense bush, swampy bush above village along Saramacca Trail, Jacob kondre, *23876*. Costa Rica to West Indies, Brazil, and Bolivia.

In this species the fruit is 5-celled, and this is the basis for its separation as the genus *Nonatelia*. A careful account of the Psychotrieae of Surinam was published by Bremekamp, and the species of that country are disposed satisfactorily by him in the *Flora of Surinam*. His alignment is satisfactory for the Psychotrias of that one region, but does not take into account the very numerous species of other parts of tropical America—and the Old World. Until a comprehensive treatment of the group as a whole is published, it seems to the writer almost necessary to treat all the species of *Psychotria*, in the traditional sense of that group, as constituting a single, highly polymorphic genus.

PSYCHOTRIA ULIGINOSA Swartz. *Notapleura uliginosa* Bremekamp. BRITISH GUIANA: flowers white, fruit red, plant succulent, the stipules thick, projected downward, infrequent, dense second-growth,, Kamuni Creek, Essequibo River, *22860*. Southern Mexico to Panama and West Indies; widely dispersed in northern South America.

RUDGEA CORNIFOLIA (Humb. & Bonpl.) Standl. *R. fimbriata* (Benth.) Standl.; *Strempelia fimbriata* Bremekamp. BRITISH GUIANA: much-branched shrub of inundated *Mora* forest by river, to 2.5 m. tall, flower buds greenish cream, Takutu Creek to Puruni River, Mazaruni River, *F2080;* shrub 2–2.5 m., laxly branched, brittle, gregarious by water paths in *Mora* forest, calyx green, corolla white, the lobes recurved, same locality, *F2002*. Southern Mexico to Colombia, the Guianas, and northern Brazil.

RUDGEA CORNIGERA Bremekamp. SURINAM: infrequent, shrub to 3 m., fruit red, Zanderij II, *23705*. Known only from Surinam.

RUDGEA HOSTMANNIANA Benth. BRITISH GUIANA: tree 6 m. high, 10 cm. diam., tall secondary forest on lateritic gravelly soil, leaves thick-leathery, stiff, brittle, inflorescence white, the corollas white, fleshy, wooly inside, Mabaruma, Aruka River, N. W. D., *F2393*. SURINAM: infrequent shrub or small tree to 4 m., fruit red, river banks below rapids, Jacob kondre, *23833*. Venezuela; Guianas.

RUDGEA GRACILIFLORA Standl. BRITISH GUIANA: shrub or small tree to 3.5 m. tall, morabukea forest on lateritic soil, flowers white, calyx small, white, flowers sweetly scented, Takutu Creek to Puruni River, Mazaruni River, *F2041*.

It is with some doubt that this collection is referred to *R. graciliflora*, which is known otherwise only from the type, from the Rio Macubirjim in the Breves region, Pará, Brazil. The type specimen, formerly in the Berlin herbarium, presumably has been destroyed, but there is a good photograph and a fragment of it in the Chicago Herbarium. The leaves of the British Guiana plant are larger than those of the type specimen, but otherwise I am unable to find any differences between the two collections.

SPERMACOCEAE

BORRERIA CAPITATA (Ruiz & Pavón) DC. SURINAM: frequent, flowers white, Savanna III, Tafelberg, *24272*. Generally distributed in tropical South America.

BORRERIA LAEVIS (Lam.) Griseb. BRITISH GUIANA: herb to 1.5 m. high, flowers white, damp soil, openings in *Mora* and mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22920*. SURINAM: frequent, flowers white, primary jungle near Posoegronoe, *24023*. Generally distributed as a weed throughout tropical America.

BORRERIA VERTICILLATA (L.) Meyer. SURINAM: frequent, flowers white, Zanderij I, *23735*. Generally distributed in tropical America.

DIODIA HYSSOPIFOLIA (Willd.) Cham. & Schlecht. SURINAM: frequent, flowers pinkish, sand pockets in rocks, Grasi Falls, Saramacca River, *24941*. Colombia to Venezuela, Brazil, and Bolivia.

DIODIA SARMENTOSA Swartz. SURINAM: infrequent vine, climbing to 4–5 m., river banks below rapids, Jacob kondre, Saramacca River, *23821*.

MITRACARPUS DISCOLOR Miq. SURINAM: infrequent, flowers white, savanna, Zanderij I, *23734*. British Guiana; northern Brazil.

PERAMA DICHOTOMA Poepp. & Endl. BRITISH GUIANA: flowers blue, locally frequent, dry rocky ground, Kaieteur Savanna, *23211*. SURINAM: frequent, flowers blue, base of dripping cliffs, Tafelberg, *24192*. The species is new for Surinam; also in Venezuela and Brazil.

PERAMA GALIOIDES Poir. BRITISH GUIANA: flowers yellow, damp sand, Kaieteur Savanna, *23129*. Venezuela; northern Brazil.

PERAMA HIRSUTA Aubl. SURINAM: frequent, flowers yellow, shallow bogs, Savanna I, Tafelberg, *24212;* flowers yellow, along railroad km. 70, Sectie O, *23629*. Trinidad; Guianas; Venezuela.

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THE CHEMICAL NATURE OF "CASSIC ACID": ITS IDENTIFICATION AS RHEIN[1]

MARJORIE ANCHEL[2]

The isolation of an antibiotic substance, "cassic acid," from the leaves of *Cassia reticulata* Willd. was reported in this journal recently by Robbins, Kavanagh and Thayer (1). Chemical investigation of this substance has shown it to be an anthraquinone derivative possessing two hydroxyl groups and a carboxyl group. Since the properties of "cassic acid" resembled those of rhein, a substance previously isolated from *Rheum officinale* (2), and from *Cassia angustifolia* (3), a comparison of the two compounds was made. For this purpose, rhein was isolated from *Rheum officinale* ("Rhubarb Root, U.S.P., Chinese," Penick), and was also prepared synthetically. Both samples proved to be chemically identical with the antibiotic substance from *Cassia reticulata*, and possessed the same antibiotic activity against *Staphylococcus aureus*. Identity of "cassic acid" with rhein establishes its structure as 4, 5-dihydroxy anthraquinone 2-carboxylic acid (4, 5, 6, 7).

THE NEW YORK BOTANICAL GARDEN
NEW YORK

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[1] A more detailed report will appear in the Journal of Biological Chemistry.

[2] This investigation was supported in part by a grant from the Albert H. and Jessie D. Wiggin Foundation.

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TORREYA

FIELD TRIP REPORTS

April 4, 1948. Pine Barrens. The trip for *Corema conradii* in the pine barrens was successful. We regret that Mr. Frazee's illness made it impossible for him to conduct the tour. First stop was at the stand of tall pines, mostly *Pinus echinata*, near Sym Place. The crowberry was in flower and thrifty in appearance. Pollination was mostly over. One member of the party reported it as being at the height of pollination on March 30. Other plants in flower at this date were *Pyxidanthera barbulata*, *Chamaedaphne calyculata*, *Epigaea repens*, and the *Carex umbellata*. Red maple flowers had dropped.

After lunch the group visited places in the West Plains to see further displays of *Corema*.

Attendance 14. Leader, David Fables.

April 10, 1948. Watchung Reservation. A walk through the Watchung Reservation with the Reptile Study Society of America yielded a few early spring plants such as *Dicentra cucullaria*, *Sanguinaria canadensis*, and *Erythronium americanum*. Several great blue herons were noticed flying overhead while the party was eating lunch at Surprise Lake. Unfortunately the day was quite cold and the herpetological results were confined to a few red-backed salamanders (*Plethedon cinereus*).

Attendance 3. Leader, Nellie L. Condon.

April 18. Flatbrookville Road to Harding Lake. Some fallen logs were cut from across the Appalachian Trail and the usual clipping of vegetation along the pathway was accomplished. Our section is in good hiking condition. The group also hiked north from Flatbrookville Road to Harding Lake. *Saxifraga virginiensis* and *Epigaea repens* were the only flowers seen on the ridge of the mountain. Later, in a hemlock glen near Blairstown, all of the expected plants of early spring were found in bloom.

Attendance 9. Leader, John A. Small.

April 24. Darby Creek. A joint trip with the Botanical Society of Pennsylvania. The Darby Creek location is only about fifteen minutes by trolley from the western extremity of Philadelphia and is the best botanizing area near city limits. Plants observed were *Polemonium reptans* just coming into bloom, *Dentaria heterophylla*, a plant which reaches the northern limit of its range here, and *Ranunculus ficaria*. *Sedum ternatum* was also found but is probably not native in this area. The group proceeded to Crum Creek, a short distance farther from the city and off the beaten track, where several uncommon plants were found, notably *Obolaria virginica*, also at the northern edge of its range, *Hybanthus concolor*, and *Poa cuspidata*.

Attendance 32. Leader, Dr. Walter Steckbeck.

April 25. Sparta to Springdale. Weather and flora conspired to make the day an enjoyable one for all participants. After assembling at the Sparta Post Office the group proceeded by car to the railroad station where cars were parked and a short foray into a nearby swamp was made. *Trollius laxus* and *Cardamine douglasii* were produced in full bloom, as well as an interesting array of early spring plants in various stages of development.

Sparta Glen, a magnificent stand of hemlocks with a little mountain stream flowing through it, was chosen for lunch. It was particularly interesting to note the survival of *Streptopus roseus* here, since it was recorded in Britton's "Catalogue of Plants Found in New Jersey" for 1887.

Through the kindness of Mr. Lee Edwards we were permitted a glimpse of a rare horsetail (*Equisetum pratense*) in a neighboring glen.

The group then made a short trip to the limestone belt at Springdale to see some of the more interesting ferns found in that locality. En route home a final foray was made into a wooded swamp near Succasuna under Mr. G. G. Nearing's guidance where *Helonias bullata* was coming into bloom, as well as *Coptis trifolia*.

We were very fortunate on this field trip to have such able botanists as Mr. E. J. Alexander, Mr. Lee Edwards, and Mr. G. G. Nearing to help us out of any difficulties in identification which confronted us during the day.

Attendance 20. Leader, James K. McGrath.

May 2. Netcong to Cranberry Lake. From Netcong, N. J., the group drove about four miles to an abandoned stretch of Lackawanna R.R. right of way. The footwork took us along a stream where *Caltha palustris* was conspicuously in flower. We passed Jefferson Lake and reached a charming hemlock glen. Passing the Cascade Iron Mines, which have been out of operation for some seventy years, we climbed over some ridges, crossed a swamp and descended through long abandoned fields to the vicinity of Cranberry Lake, thence back along the railroad. A list of 35 plants in flower or imminently so, excluding weeds, was compiled. Besides the *Caltha*, the display of violets in white, yellow, and blue was perhaps the most impressive.

Attendance 21. Leader, Major Lyman Barry.

May 2, 1948. Silver Lake, White Plains, N. Y. A trip to one of the few good botanizing areas surviving near New York City. Some 68 species of plants were recorded. The fine display of *Orchis spectabilis* was the highlight of the trip.

Attendance 18. Leader, Farida A. Wiley.

May 8–9, 1948. Camp Thendara, Palisades Interstate Park, N. Y. A joint trip with the New York Section of the Green Mountain Club. Camp Thendara was as big and hospitable as always with the largest attendance recorded in the history of the bird censuses. We are indeed grateful to the New York Section of the Green Mountain Club and our hostess Mrs. Laura W. Abbott for the excellent arrangements.

Saturday was cold and overcast but one group hiked from camp to the Fingerboard Mountain Shelter via the Appalachian Trail, and thence up the Arden Valley Road to the fire tower. None of the forest trees were in full leaf. *Amelanchier canadensis* was observed in bloom.

A plant seen on Sunday, possibly new for the season's listing was *Polygala pauciflora*. Sixty-one bird species were identified in the field under Mr. Howard H. Cleave's able leadership.

Attendance 49. Leader, Laura W. Abbott.

May 8, 1948. Slabsides, West Park, N. Y. The annual pilgrimage of the Torrey Botanical Club and John Burroughs Association to "Slabsides," the rustic retreat where many of the philosopher's essays were written. Over 150 species of plants were identified in the area. The presence of Mr. Edwin W. Teale, Dr. Clyde Fisher, Princess Teata and Professor Inez Haring contributed much to a very successful outing.

Attendance 30. Leader, Harold N. Moldenke.

May 9, 1948. Surprise Lake, Bearfort Mountain, N. J. The lake was well named. It was indeed a surprise to find a northern bog flora readily accessible by trail in our region. A black-spruce and tamarack association at the southern end of the lake yielded such plants as *Kalmia polifolia, Andromeda glaucophylla, Calla palustris, Vaccinium Oxycoccus, Nemopanthus mucronata, Ilex monticola,* and *Coptis trifolia.*

Luncheon was enjoyed at Prospect Rock, a fine open ledge on the east side of Bearfort Mountain with wonderful views of the entire length of Greenwood Lake and the surrounding Highlands.

After descending to Lakeside by easy trail, the group proceeded by car to Sterling Forest, N. Y., for a glimpse of *Clematis verticillata, Panax quinquefolia,* and *Viola rostrata.* An interesting fungus noted at this locality was *Gyromitra brunnea.*

Attendance 15. Leader, James K. McGrath.

May 15, 1948. South River, N. J. A visit to one of the outlying "Islands" of the New Jersey Pine Barrens. Some nice patches of *Pyxidanthera barbulata* with a few

flowers remaining were found and exhibited to those members who had not seen the plant in bloom. An excellent variety of Quercus species in flower was noted here, including *Q. ilicifolia, Q. stellata, Q. velutina, Q. coccinea, Q. alba, Q. Prinus,* and *Q. marilandica.* The floral characteristics, time of flowering, and color of the early vernal leaves of each species were discussed. Other plants seen at this locality were *Vaccinium pennsylvanicum, Gaylussacia baccata, Amelanchier stolonifera, Carex umbellata,* and *C. pennsylvanica.*

Old Bridge, the next stop, was even more reminiscent of the typical pine-barren country with its characteristic white sand. Additional species recorded were *Arenaria caroliniana, Hudsonia tomentosa, Juncus Greenei,* and *Prunus maritima.* Near the traffic circle a fine stand of *Pinus echinata* was examined by the group.

Attendance 9. Leader H. K. Svenson.

May 21–23, 1948. Branchville Nature Conference. Another very interesting "gathering of the nature clans" at Sussex Pines with Mr. Wallace Husk. The excellent program, able leadership, and comfortable surroundings seem to be omnipresent at all the conferences, for which we should express our thanks to the Program Committee.

Mr. Charles Roth had an especially fine night for astronomy. All five major planets were observed in the sky during the early part of the evening.

Those of the group interested in minerals were taken to a limestone quarry by Mr. Skidmore for fluorescent minerals. He also exhibited a number of nice specimens from his extensive collection.

Other field trips were led by Mr. David Fables for birds and Dr. H. N. Moldenke for trees and flowering plants. A color film by Mr. and Mrs. Schaughencys and a lecture on birdbanding by Mrs. H. Carnes completed the program.

Attendance 85. Leader, James Hawley.

May 22, 1948. Avalon, N. J. A joint trip with the Botanical Society of Pennsylvania. The group botanized from train windows en route and were rewarded with many fine views of *Lupinus perennis* in full flower. An albino clump was spotted by Dr. J. M. Fogg, Jr. Between Tuckahoe and Cape May Courthouse a nice display of *Senecio tomentosus* was seen. In complete contrast to the blue and yellow plants, a field of *Trifolium incarnatum* supplied the primary red with its dark red flowers.

Upon reaching Avalon the group walked toward the ocean and then south on a gravel road paralleling the beach to "Open House," the summer residence of Mr. George E. Lippincott. The most interesting plant found during the day was recorded from this locality:—*Myosotis micrantha* in flower and abundant in the surrounding vacant lots. This little *Myosotis* was not reported by Fender in her "Flora of Seven Mile Beach, N. J." (Bartonia No. 19, 1937) but was collected on the Torrey trip to Point Pleasant, N. J., under similar conditions on May 16, 1943. It was also found in Ocean City, N. J., in July, 1935, by the late Dr. Charles R. Bridgett, a Philadelphia eye specialist with botany as a hobby. Taylor, in his "Flora of Vicinity of New York, 1916," lists the plant as a waif. It certainly is thoroughly established now along a good stretch of the South Jersey coast and it would be interesting to see how well represented the species is in the various herbaria. Other plants recorded in this area were *Smilacina stellata, Silene pennsylvanica, Aquilegia canadensis, Arabis lyrata, Cirsium spinosissimum, Amelanchier stolonifera, Trifolium dubium, Festuca octoflora,* and *F. rubra.*

The group had lunch on the "Open House" dune which is the second highest dune on the Jersey coast. Fine unobstructed views of the ocean and inland waterway with its extensive marshes were available.

After lunch the group botanized along the dunes and strand. The usual plants such as *Ammophila, Psedera, Prunus maritima,* etc., were abundant on the dunes as well as *Lathyrus maritimus* and *Lonicera sempervirens.*

The return to Cape May Court House by bus allowed about twenty minutes to make a brief foray into a nearby wooded swamp to see if *Helonias bullata* was still in flower, but was unsuccessful, as only a few mature fruting spikes were seen.

Attendance 13. Leaders, Louis E. Hand, George E. Lippincott, John M. Fogg.

May 23, 1948. Ardsley, N. Y. A leisurely walk from Ardsley to Elmsford, N. Y.

gave the group an opportunity to observe an impressive number of plants. About 85 species were recorded by the leader.

The outstanding botanical "find" on this trip was a number of specimens of *Helianthus mollis*, not in bloom, observed along the Saw Mill River Parkway. This species is not recorded for the locality in Taylor's "Flora of Vicinity of New York."

Other interesting plants not familiar to the group were *Duchesnea indica, Hydrophyllum virginianum, Tragopogon pratensis, Hieracium pilosella,* and *Antennaria neodicoica.* Two unusual mosses were found in fruit *Dicranella rufescens* and *Hygroamblystegium irriguum.* Fungi were represented by a fine specimen of *Morchella crassipes.*

Attendance 14. Leader, William Rissanen.

May 30, 1948. Bartlett Tree Research Laboratories. The trip included an extremely instructive tour of the laboratory grounds with its evergreen plantings, rock gardens, various experimental plots for spray tests, and the insectory where the life cycles of various tree insects are studied.

Particularly interesting to the members was the Bartlett Chestnut, a fine blight-resistant oriental chestnut. This was the parent tree which was severely damaged by the hurricane of 1944. Hundreds of seedlings were grown from this tree and before the hurricane as much as fifty pounds of nuts were harvested annually. It is not blight-immune but decidedly resistant to the chestnut bark-disease. Over 3,000 seedlings from the tree have already been distributed throughout the United States as well as Italy and northern Africa. The Bartlett Chestnut seeds naturally as the old American Chestnut did.

Attendance 12. Leader, Harold N. Moldenke.

News Note

The McCollum-Pratt Fund for the Study of Trace Elements. Dr. Isaiah Bowman, president of Johns Hopkins University, has announced a generous gift by one of its Trustees, Mr. John Lee Pratt, of Fredericksburg, Virginia. The gift will be known as the McCollum-Pratt Fund after Dr. E. V. McCollum, the noted authority on nutrition and discoverer of vitamins A and D, and the donor, Mr. Pratt. The fund will be devoted to the study of the effects of the so-called "trace" elements upon plants, animals, and man.

In explaining the purpose of the study, Dr. Bowman pointed out that research during the past twenty-five years has shown to an increasing degree that exceedingly small amounts of certain minerals, so small as to be designated only as "traces" in most chemical analyses of soils and plants, have an effect—sometimes profound—on the health of plants and animals. Their absence or deficiency leads to "deficiency diseases" of considerable range. Among the conspicuous examples of "trace" elements are copper, boron, cobalt, and manganese.

An interdepartmental committee will act as an advisory board to help select suitable personnel and guide the project. The four departments and their representatives initially concerned are: biochemistry (Dr. McCollum), geography (Dr. Robert L. Pendleton), sanitary engineering (Dr. Abel Wolman), and preventive medicine (Dr. Perrin H. Long). Dr. George F. Carter, chairman of the Department of Geography, will act as secretary of the advisory group until a special staff is assembled.

Notice

Approximately $1000.00 is available in the Mary S. Andrews research fund of the Torrey Botanical Club. This may be awarded, in whole or in part, for any aspect of botanical research, during the year 1949. Applications should be addressed to Edwin B. Matzke, Department of Botany, Columbia University, New York 27, N. Y., not later than March 1, 1949.

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COMPILED BY

LAZELLA SCHWARTEN

WITH THE COLLABORATION OF THE EDITOR OF THE TAXONOMIC INDEX

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